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EDITORIAL ANNOUNCEMENTS.

THE BRITISH AND EASTERN CONTINENTS edition of the Railroad Gazette is published each Friday at Queen Anne's Chambers, Westminster, London. It consists of most of the reading pages of the Railroad Gazette, together with additional British and foreign matter, and is issued under the name Railway Gazette.

CONTRIBUTIONS.—Subscribers and others will materially assist in making our news accurate and complete if they will send early information of events which take place under their observation. Discussions of subjects pertaining to all departments of railroad business by men practically acquainted with them are especially desired.

ADVERTISEMENTS.—We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay, EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and these only, and in our news columns present only such matter as we consider interesting and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers, can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially either for money or in consideration of advertising patronage.*

CONTENTS

EDITORIAL:
- Clearing Houses for Railroad Balances.... 25
- Cast-Iron Wheels. 25
- The Great Northern in British Columbia.. 26
- Noise Around Sleeping Cars..... 26
- New Publications 26
- Trade Catalogues 27

ILLUSTRATED:
- 7,000-Gal. Tender; Louisville & Nashville. 28
- Tennessee River Bridge; Illinois Central.. 31
- Cole Balanced Compound for the Erie..... 37
- New Manhattan Terminal for the Brooklyn Bridge. 40
- A Semaphore with a Vertical Motor..... 42
- Box Cars for the Argentine State Railways 44
- Holmen Coaling Station on the Pennsylvania Lines West of Pittsburg 46
- Special Flat Cars for Egypt. 48

CONTRIBUTIONS:
- Cast-Iron Wheels 27
- Allfree-Hubbell Locomotive Valve Gear.... 28

MISCELLANEOUS:
- Calculating the Cost of Handling Freight at Large Stations 36
- A Railroad Clearing House..... 37
- Clearing House Not Needed..... 39
- Road Tests of B. & O. Mallet Compound.. 42
- Transportation of Explosives on P. R. R. 43
- The Testing Engineer..... 45
- Locomotives at the Liege Exhibition..... 47

GENERAL NEWS SECTION:
- Notes 9
- Meetings and Announcements 11
- Personal 11
- Elections and Appointments. 12
- Locomotive Building 14
- Car Building 14
- Bridge Building 14
- Railroad Construction 15
- Railroad Corporation News 16

VOL. XXXIX, No. 2. FRIDAY, JULY 14, 1905.

Mr. Midgley's proposition to establish clearing houses for settling freight and passenger balances between railroads may with the "average reader" find more or less acceptance; but when it encounters experienced railroad accountants things are not so serene. The accountants are, in fact, up in arms at once. We print Mr. Midgley's essay on another page, followed by what the accountants have to say about it. Neither side presents anything like an adequate or comprehensive argument, or even a clear statement of the facts. We do not know that it is necessary or desirable that either of them should. There has not been any loud demand for a clearing house lately, except from Mr. Midgley himself; and he will need to get a larger following before his cry will amount to much. The obvious argument in favor of a clearing house is that it saves labor and time; avoids repetition of writings and enables cash settlements to be made more promptly. But *how much* saving? In England, by reason of the compact territory, the small number of companies, and the stability of rates, it seems to have been possible to clothe the clearing house with authority to settle a large share of the disputes summarily—without waiting to get authority from either party to the dispute. This is a vital matter. If there were no disputes about monthly statements a clearing house would run like a clock anywhere. In this country the abolition of the great mass of correspondence about differences is probably entirely out of the question. This being so, each road would continue to keep as full records in its own office as it kept before; and that would spoil the argument about saving in clerical work. An American railroad treasurer sends out, say, 500 checks a month to 400 different railroads. The clearing house, let us say, would reduce this to one check a month. This would be a real saving in any business. But, as Mr. Kirkman and the other accountants intimate, this in itself is not a sufficiently large saving to warrant the establishment of an immense bureau, which would multiply papers, fill the baggage cars with letters, and grow fat on its own vanity.

CAST-IRON WHEELS.

The discussion which has been going on recently over the use of cast-iron wheels under high-capacity cars differs somewhat from previous discussions, which have taken place periodically during the last twenty years in that the purely mechanical problem of producing a wheel of chilled cast-iron which is safe and which will give good service has been lost sight of. The discussion has hinged on the commercial problem of whether or not a cast-iron wheel can be made for a certain price and at the same time be safe and give long service. The mechanical problems involved in the design and manufacture of cast-iron wheels for freight cars are more difficult than they have ever been before, because of the greater loads and speeds, but, at the same time, they are not impossible of solution. Mr. P. H. Griffin pointed out some of these problems in his contribution printed in these columns on May 19, but there are others which he did not touch upon. Mr. Muhlfeld, in his valuable paper on the cast-iron wheel problem printed in the *Railroad Gazette* May 5, suggested certain changes in design which, in his opinion, would remedy some of the many defects which have developed in service under 100,000-lb. cars. Elsewhere in this issue will be found still another contribution on the subject. This is by a wheel maker, who suggests some improvements in foundry practice and changes in design which he believes will produce an entirely satisfactory wheel. Certain recent tests of the breaking strength of cast-iron wheel flanges would seem to indicate that for very heavy loads, with the existing form of wheel flange, cast-iron wheels are not safe to use; and the makers of steel wheels have taken the results of these tests as a basis for the argument that only steel wheels should be used under cars of high capacity, or cars which are run at high speeds. The cast-iron wheel makers presented to the Master Car Builders' Association last month a proposition to reduce the guarantee on wheels, claiming that it was not possible to make a wheel at the price which the railroads were willing to pay, which could be guaranteed for the time now usually named, and against the defects specified in the form of guarantee now in general use.

Briefly stated, then, the wheel situation is this: Cast-iron wheels under high capacity cars are not giving altogether satisfactory service, and with the keen competition and the severe tests required, coupled with the unwillingness on the part of the railroads to pay more for a higher quality wheel, the problem has resolved itself into one of how good a wheel can be made for a certain price. And this commercial aspect, as before said, has caused both wheel makers and railroads to lose sight of the more important mechanical problems. Mr. Griffin, speaking for the wheel makers, admits that their chief aim is to make wheels as cheaply as they can be made and stand the tests imposed by the railroads, without regard to durability; and the railroads, in trying to save money on renewals, endeavor to turn back on the makers as large a share as they can of the wheels which are condemned. Both parties are trying to save pennies by working at cross purposes, when they might be saving dollars by working together.

The cast-iron wheel has come in for much more than its fair share of condemnation since the introduction of the high capacity car. Because it has failed under such cars more frequently than under

cars of lighter capacity, its enemies have been quick to claim that it was unfit for such service, when, as a matter of fact, almost any type of wheel would have failed under similar conditions. The most frequent cause of failure of wheels is the heating action of the brake shoes combined with the rubbing of the flange against the rail. As far as vertical strength is concerned, the cast-iron wheel apparently has an ample reserve; but under high capacity cars the braking action and the flange wear are both much more severe. Normally, there is no flange wear on straight track, unless the truck fails to return to its normal position after leaving a curve. If a car has weak bolsters or badly designed center plates and side bearings a truck may be held in a slued position, and the wheel flange grind on the inside of the rail mile after mile. Any wheel would show flange wear under these conditions, and it is obviously unfair to criticise the cast-iron wheel because it fails under such conditions. The fault is not with the wheel.

The heating action of the brake shoes under heavy cars is much more severe than under light cars, for two reasons: First, because there is more braking pressure with practically the same area for radiation of the heat; and, second, because, as a rule, the high capacity cars are braked more continuously—a larger part of the time—than the lighter cars. In making up trains the heaviest and strongest cars are usually put next to the engine, and the light cars in the rear of the train. The trainmen then couple up the air brakes on the first ten or fifteen cars and depend on the brakes of those cars to control the entire train. This practice has been very general up to the time when the statutory requirement of 50 per cent. came into operation. On mountain roads where retaining valves are used, the front cars in a train may have the brakes applied continuously for as long as an hour, while the rear cars have only a few hand brakes set up. This practice undoubtedly has much to do with the larger percentage of wheel failures under high-capacity cars than under cars of lighter capacity. We are not criticising the practice, because experience has shown that in many situations probably this is the best way to control a train; we simply are pointing out that it is not fairly the fault of the wheel when it fails under such service.

We do not here discuss the relative merits of the different designs of single and double plate wheels, with and without brackets, which have been suggested as improvements over existing designs. Experience only can determine whether or not minor changes in the shape and location of the brackets and plates will prevent troubles from cracks in the body of the wheel due to uneven expansion, or whether they will assist in radiating the heat from the tread to such an extent as to eliminate part of the trouble from transverse and longitudinal cracks. The most radical suggestion which has been made is to thicken the flange and to enlist the co-operation of the maintenance of way departments to increase the clearance at frogs and guard rails so that a thicker flange may be used. With a thicker flange more gray iron can be used to re-inforce the weakest point of the wheel without sacrificing any of the chill. From experience on the Southern Railway it would seem that this can be done with no difficulty.

Viewing the whole matter impartially there would seem to be no reason to doubt that some of the many expedients proposed to improve the quality and increase the strength of cast-iron wheels will eventually prove satisfactory; will remove all ground for fear that the cast-iron wheel is unsafe and cannot be made safe to run under the conditions of modern service. The best care on the part of the founder and the use of high-grade charcoal iron would eliminate many of the troubles now experienced; and as regards this feature of the matter it is only a question of whether the railroads prefer to pay a moderate price for the better material and for the better foundry practice adopted, or to pay much more for steel wheels, which apparently have an excess of strength, but which have not yet shown that they have a sufficiently longer life to pay for the difference in first cost. It is a significant fact that in their petition to the Master Car Builders' Association asking to have the guarantee reduced, the wheel makers made no claims about being able to produce a wheel to meet the present guarantee if the railroads were willing to pay for it. This can hardly be taken as an admission that they cannot produce such a wheel, but it would have made their position stronger had they offered a specification and a guarantee for higher priced wheels, and had shown that they were prepared to furnish such wheels if the railroads wanted them. Their attitude is thus a defensive one, and they have not strengthened their position by taking it. Meanwhile, the steel-wheel makers are taking every advantage of the situation to secure favor, and by means which necessarily tend to create distrust of the cast-iron wheel. The question is not yet by any means settled, but nothing has occurred thus far to justify the notion that the chilled-wheel makers must go out of business. They know how to make better wheels, and they ought to know how to induce the railroads to use better wheels.

Somewhat imperfectly and through the mists of partisanship in the Canadian journals the details reach us of a railroad contest at Ottawa which involves some broad principles of national—and international—policy. It appears that some time ago when President Hill, of the Great Northern, acquired the British Columbia charter for the Victoria, Vancouver & Eastern Railroad, he found that document imperfect for his ends, as it requires the road to be "all-Canadian," i.e., entirely within Canadian territory. This defect he now seeks to mend by obtaining Canadian authority to cross the border at intervals and at eligible points for local traffic. Both President Hill and the Canadian Pacific, it should be added, are pushing into southern and southwestern British Columbia to obtain the first grasp of the trade—and thus, in a sense, an "all-Canadian" line is antagonized with an American system seeking both the Pacific traffic and a kind of in and out business along the border. Hence arises a question of considerable national magnitude in Canada, especially as applied to its far western but, in large regions, rapidly developing border land where railroad facilities are so vital. Should Canadian policy, in such a case, it is asked, insist on the "all-Canadian" idea in the development of railroads—while, of course, conceding the right of President Hill to connect with his main system—or should it ratify what his opponents call his "see-saw" plan? "Keep the railroad business in Canada," say the Canadian foes of his project, "and protect and build up our own lines." To which comes the reply: "Break up the Canadian Pacific monopoly. Give our new settlers the quickest railroad facilities they can get and the cheapest access to the markets." We confess our acute sympathy with the latter Canadian plea rather than the former, especially when we reckon in on the one hand the crying need for railroads in new communities and, on the other hand, the larger fact that nations mutually profit by international railroad intercourse. But whatever the theory, the international practice will probably have to be reciprocal. If Mr. Hill is to be permitted to "see-saw" back and forth across the far western Canada border the Canadian Pacific can with justice demand the same privilege. The raising of the general question on our northwestern boundary, where communities on both sides are probably as unanimous in getting railroads as they are indifferent to the nationality of the builders, suggests that the problem will grow deeper and, it may be, reach a diplomatic stage before it is solved.

Speaking of one of the most prominent railroads in the United States a daily newspaper says: "Wisely mindful of the comfort of passengers traveling in sleeping cars the ——— has issued orders to all departments to avoid all unnecessary disturbances in the vicinity of sleeping cars, while trains to which the sleepers are attached are halting at stations or in the large yards of the company." As all well-regulated railroads have had a rule like this in their codes for years, this item means, we suppose, that some officer on the road referred to is trying to make the re-issue of a rule take the place of the care and patience necessary to enforce a rule already issued. And is not this one of the features of the service for which there should be more inspectors? It is safe to say that not one superintendent in a hundred takes the intelligent care to do his part in this matter that the Pullman superintendent does to do his part. If a Pullman employee breaks one of the rules pertaining to passengers' comfort he is likely to hear from his boss very soon; but enginemen may ring bells, bump buffers and even blow whistles, at any hour of the night and nothing is said. At least this is the impression that one gains frequently while riding in sleeping cars. Keeping everything quiet while handling locomotives and cars is a matter requiring a high degree of intelligent care, and only by efficient and vigilant inspection can such care be insured.

NEW PUBLICATIONS.

Practical Perspective. By Frank Richards and Fred H. Colvin. New York: The Derry-Collard Company, 1905; 5 in. x 8 in., flexible cloth, 60 pages, illustrated. Price 50 cents.

The object of this book is to show the practical value of isometric perspective by removing the difficulties that have prevented its wider use. Isometric perspective is really the only practical perspective in which to show mechanical work, and the authors seem to feel that if the simplicity of this style of drawing could be made clear to the draftsman it would be more generally used than at present. In the first part of the book Mr. Richards explains in simple language the principles of isometric drawing. This is supplemented by illustrations which are so clear that it is hard to see how any one, having a taste for drawing, could but help to master the subject after carefully following the instructions. The second part of the book,

by Fred H. Colvin, explains the use of the D-C isometric sketching paper, and shows examples of work done on it, including architectural details, lathe work, locomotive details, structural steel work, etc.

Performance of Automatic Block Signals Under Unfavorable Conditions. By H. S. Balliet. New York: The *Railroad Gazette*, 83 Fulton street. Pamphlet, 42 pages. Price, 50 cents.

This is a reprint of the original, interesting and highly useful papers by Mr. Balliet, which were published in the *Railroad Gazette* last year. In them he describes the experiences of himself and of many other signal engineers in dealing with the numerous and varied difficulties connected with the maintenance and operation of automatic signals in severely cold weather—42 deg. F. below zero—as well as in all other temperatures; and also in seasons when lightning and other atmospheric or terrestrial phenomena disturb the working of electrical apparatus. Mr. Balliet not only has had unusual and extensive experience in this field but also brings to his work the qualification to discriminatingly weigh and comment upon those experiences of other men which he incorporates in his essay.

TRADE CATALOGUES.

Painting Structural Steel.—The fourth edition of "Hints on Painting Structural Steel" by Houston Lowe, of The Lowe Brothers Company, Dayton, Ohio, has lately been issued. The book is in pamphlet form, 5½ x 8, contains 45 pages, and is intended as a hand-book for paint users. It discusses briefly the problems of preserving and protecting steel and iron in bridges, railroad equipment and other structures, and contains suggestions of specifications for cleaning and painting structural steel with a view to obtaining best results. There are chapters on Paint and Painting, Steel, Rust and Cleaning; on Liquids and Solids for use in metal coverings; also chapters on Tests and on Conclusions. The book is an interesting and instructive contribution on the subjects with which it deals.

The Chicago & North-Western passenger department includes in its summer literature two pamphlets bearing the respective captions "The Pacific Northwest" and "Personally Conducted Tours." The former contains 51 pages devoted to the natural resources, scenic features and commercial advantages of Oregon, Washington and Idaho. It is fully illustrated with half-tone views. Some space is devoted to the Lewis and Clark Centennial exposition, and a page to Alaska. The second pamphlet gives the itineraries, with expenses and features of the trips, of four personally conducted tours from Chicago to the Pacific Coast and return, over the North-Western and Union Pacific lines. The dates for leaving Chicago are July 6, 12 and 27 and August 10 respectively.

Valves and Gages.—The Ashton Valve Co., Boston, Mass., sends its complete catalogue No. 12. It is 6 in. x 9 in. and contains upwards of 120 pages. A full page half-tone portrait of Henry G. Ashton, founder of the company, is shown on the front page. This is followed by illustrations and descriptions of the various devices made by the company such as "pop" safety valves, water relief valves, cylinder relief and drifting valves, blow-off valves, steam vehicle fittings, chime whistles, pressure and vacuum gages, revolution counters, engine registers, locomotive and marine clocks, gage testers, gage cocks, water columns, test pumps, thermometers, pyrometers, etc.

Smooth-On Elastic Cement.—The Smooth-On Mfg. Co., Jersey City, N. J., sends a copy of its new Smooth-On elastic cement instruction book. This cement is the latest production of the above company. It is an iron elastic cement prepared in paste form, ready for use. The advantages claimed for it are that it is metallic and can be applied to hot iron, the heat causing it to metallize instantly, which makes it invaluable for stopping leaks.

Modern Sanitation.—This is the title of a monthly magazine published by the Standard Sanitary Mfg. Co., Pittsburg, Pa. It is exclusively devoted to the advancement of sanitary plumbing and the June issue contains Part V. of an interesting series of articles on the "Principles and Practice of Plumbing" by J. J. Cosgrove. Parts I., II., III. and IV. of the above series will be furnished upon request to the publishers.

Steel Piling.—The Friestedt Interlocking Channel Bar Co., Chicago, sends an interesting catalogue descriptive of its interlocking channel bar piling. Details of its construction are shown and illustrations of various structures throughout the country in which it is used are given. Its advantages and extensive field for applicability are also set forth.

Pop Safety Valves.—The American Steam Gage & Valve Mfg. Co., Boston, Mass., sends an illustrated folder descriptive of its American special pop safety valve. This valve is designed for a working pressure up to 300 lbs. with a test pressure of 450 lbs. It is made in single and duplex types. In the duplex type the two valves are mounted on one body casting having a common inlet and a common outlet.

"Compressed Air."—The June issue of this magazine, issued by the Ingersoll-Sergeant Drill Co., is being distributed. It contains a number of interesting articles devoted to applications of compressed air. It also contains a general round-up of the pneumatic tools and devices which were exhibited at the recent railway appliance exhibit in Washington.

Graphite.—The Joseph Dixon Crucible Co., Jersey City, N. J., is distributing its July issue of Graphite. It contains an article on "Grease and Automatic Grease Cups," also one on "The Care of Driving Belts." It also contains its usual amount of light reading matter.

Storage Batteries.—The Electric Storage Battery Co., Philadelphia, Pa., sends its bulletin No. 95, which describes in detail the application of storage batteries to the lighting and power plant of the Carnegie Steel Co.'s plant at Youngstown, Ohio.

Wattmeters.—The Westinghouse Electric & Mfg. Co., Pittsburg, Pa., is distributing a small illustrated pamphlet descriptive of its Type B integrating wattmeter, single-phase, 7,200 and 16,000 alternations, for two and three-wire circuits.

The Tabor Indicator.—The Ashcroft Mfg. Co., New York, sends a handsomely illustrated catalogue descriptive of the latest type of the Tabor indicator and of indicator parts and supplies.

CONTRIBUTIONS

Cast-Iron Car Wheels.

McKees Rocks, Pa., July 10, 1905.

TO THE EDITOR OF THE RAILROAD GAZETTE:

Following the introduction of the 100,000-lb. capacity car has come a succession of failures in the detail parts of car equipment. This is particularly true of the cast-iron wheel which has failed so signally. The railroads and the wheel makers have recently been discussing with much concern ways and means for improving its efficiency, and some have even gone so far as to suggest its entire abandonment under high capacity cars. Among the most important suggestions which have been made for overcoming the difficulties, the following may be particularly noted:

(a) Designing the wheel with a single plate located almost under the sand rim and increasing the coning of the tread, at the same time making the throat of the wheel flange conform closer to the radius of the rail head. This design has recently been adopted by one of the large railroad systems.

(b) The railroads to pay a better price for their wheels so that the wheel makers may use more charcoal iron in their mixtures, and improve their general foundry practice. If it is true, as this suggestion implies, that a large number of the freight wrecks caused by breakages of wheels, have been due to bad foundry practice, it is evident that there has been either gross negligence on the part of the management of the wheel foundries, or that the ordinary foundry practice is fast becoming obsolete. Recent experience has shown that the continuous pouring process is the only one that will bring about the much needed improvement in cast-iron car wheel foundry practice. If the most correct design of pattern is used, and the very best irons are charged into the furnace, still a poor quality wheel will be the result if the foundry practice is bad. It is well known that the mold should be made of sand of uniform "temper," the iron melted and poured, and the wheels "shaken out" and pitted, within certain well defined limits in temperature. In ordinary foundry practice where the iron is carried at greatly varying distances from the cupola, and the wheels are shaken out at similar distances from the pits, these important conditions *cannot* be regulated with any degree of uniformity.

(c) Add ⅛ in. more metal to the back of the flange. In regard to this proposition it is interesting to know that it took nearly 5 per cent. more pressure to break a wheel flange a scant $^1/_{32}$ in. too thick, than it took to break the strongest wheel flange recorded of the tests made at Purdue University. It is also worthy of note that this wheel was cast in a continuous pouring foundry, weighed 700 lbs. taped 3 (P. R. R. 121), and had only 13 brackets. The pressure was applied between two of the brackets. It was also chilled to sufficient depth to pass the specification requirements of the principal railroads. The record of this test was brought before the members of the recent M. C. B. convention during the topical discussion on the results of the M. C. B. design wheel in service.

(d) Use a 700-lb. single-plate wheel of special design in which

the flange is practicallly a continuation of the plate, and the rim supported by brackets.

To make wheels for service under the 100,000-lb. capacity cars, I would suggest:

First.—The increased coning of the tread and the general pattern design referred to in A, except that the single-plate should be increased to $1^{1}/_{16}$ in. and the number of brackets reduced to not more than 13. The brackets act principally as "whirl gates" for the iron. When their combined area is too great the metal flows towards the chill with lessened circular motion which is detrimental to the chilled surface. In regard to the wheels now made from the design referred to in A, it is a matter of experience that whenever they crack under the thermal test and heat strains, the cracks extend under the tread and through the brackets. This is an element of danger. Wheels of the M. C. B. and similar design, under the same strains may crack at the intersection of the plates. If this occurs in service the latter design wheel will still run many miles while the former is sure to break at the first lateral blow.

Second.—Increase the flange thickness up to the limits allowed by guard-rail and track conditions. There seems to be no question about adopting this at once judging by the discussions on this point at the recent M. C. B. convention. In the meantime it would seem the part of wisdom for the railroads to instruct their inspectors to accept wheels with flanges slightly thicker than the present maximum allowed.

Third.—The wheel makers should use a mixture of such strength that the hardest wheels made from it under normal foundry conditions, will stand the thermal and drop tests. This mixture must be melted under the best cupola conditions, the iron poured at the right temperature into molds of uniform "temper," and the wheels "shaken out" and placed in the pits neither too hot nor too cold.

Fourth.—Improved car and truck construction. There is no doubt but that the construction of cars and trucks of early design, for the 100,000-lb. cars, has been the cause of many wheel failures.

Wheels produced as outlined above will be superior in design and quality to the best now in service under the high capacity cars, and will meet all expectations as to safety and wear.

In regard to guarantee and tests there is no doubt but that the railroads and the wheel makers should come in closer harmony and the following suggestions might assist in bringing this about:

Guarantee.

Tape 5,	P. R. R.	123—	from	plain	chills	One year less than tape 3.
" 4,	"	122—	"	"	"	½ year less than tape 3.
" 3,	"	121—	"	"	"	Normal guarantee period.
" 2,	"	120—	"	"	"	½ year more than tape 3.
" 1,	"	119—	"	"	"	One year more than tape 3.
" 0,	"	118—	"	"	"	1½ year more than tape 3.

Tests.

Tape 123,	in lots of	100.		Drop test and chill measurement.
" 122,	" "	"	100.	Drop test and chill measurement.
" 121,	" "	"	100.	Normal thermal, drop test and chill meas.
" 120,	" "	"	100.	Normal thermal, drop test and chill meas.

For each tape size below 120 an increase of 10 per cent. in the drop test, and 25 per cent. in the thermal test. Wheels with the maximum chill, manufactured as they should be, will be of sufficient strength and give the best service.

The guarantee and tests as suggested above would be fair to the wheel makers and the railroads, and would do away with the unfair and ruinous penalty now imposed by some of the methods of inspection.

J. W. HENDERSON,
Supt., Central Car Wheel Co.

Allfree-Hubbell Locomotive Valve Gear.

Chicago, July 3, 1905.

To the Editor of the Railroad Gazette:

My attention has just been called to an article appearing on pages 634 and 635 in your issue of June 9th with regard to information concerning the relative performances of Central Railroad of New Jersey locomotives No. 581 and No. 582. From the conclusion of your article it appears that you have some doubts as to the value of the report published by the officials of the Central R. R. of N. J., and you apparently think it would be relatively an easy matter to simply transfer the valve gear used on the Allfree-Hubbell locomotive 581 to the No. 582 and thereby reverse the record given in the test that has just been made.

The 582 is equipped with the Stephenson link motion only, and has cylinders 19 in. x 26 in., with ports 1⅜ in. x 18 in., and of the usual design, extending from near the center of the cylinders to each end, and contain approximately 550 cu. in. volume. When the 582 is working at 7⅛ in. cut-off, with a maximum port opening of $^{29}/_{64}$ in., exhaust occurs at 16¾ in., or after completion of only 64.4 per cent. of the stroke. Exhaust closure also takes place at 16¾ in., or at same percentage of stroke, with 9¼ in. volume in compression.

Engine No. 581 on the other hand has cylinders with exceedingly short ports opening directly into the ends of the cylinders. This engine has the usual Stephenson link motion, but supplemented by the Allfree-Hubbell valve gear. The ports to the cylinders of the 581 are also 1⅜ in. x 18 in., but are very short, being only 2 in. from the face of the valve seat to the bore of the cylinder, and are located at the extreme ends of the cylinders and contain approximately 90 cu. in. volume. When working at 6⅝ in. cut-off with a maximum port opening of $^{28}/_{64}$ in., exhaust occurs at 22 in., or after completion of 84.6 per cent. of the stroke and exhaust closure does not take place until 23 in., or after completing 88.5 per cent. of the stroke, with only 3 in. volume in compression.

You will note, therefore, that the valve gear of the No. 581 increases the expansion period and decreases the negative work of compression 66⅔ per cent. In addition to this, please bear in mind that the cylinders on both locomotives are 19 in. x 26 in., with ports of same cross sectional area, and the difference in the performance of the 581 and the 582 is materially affected by the great difference in the port volumes as previously noted.

The valve gear employed in the 581 makes possible the great reduction in the port volumes, therefore, the results given could not possibly be reversed by simply transferring the valve gear from the No. 581 to the No. 582; but, if the entire system of steam distribution, which includes the cylinders, valves, and valve gear, which constitutes the Allfree-Hubbell locomotive, are transferred from the No. 581 to the No. 582, and the cylinders, etc., of the 582 are applied to the 581, there is no doubt but that the No. 582 would then make the same showing over the No. 581 that the No. 581 made over the No. 582.

The record made by the 581 over the 582, as in all other instances where the Allfree-Hubbel locomotives are to-day in service running opposite locomotives otherwise of the same specifications, except as to steam distribution, is due entirely to the combination of the reduction of cylinder clearance (port volume), for the striking distance is always the same, increased expansion, decreased negative work of compression and a marked reduction in cylinder condensation inseparable from, and possible only in the Allfree-Hubbell locomotives because of the valve motion employed.

The details of this test on the Central Railroad of New Jersey and others were recently submitted to one of our engineers of national reputation, and commenting upon the records, he says: "The improved results obtained appear entirely reasonable and capable of being produced by the method employed."

I beg to take issue with you "that any design of valve gear could produce as high a saving in percentage of water and coal, 10.45 per cent. to 15.92 per cent., and 10 per cent. to 16.1 per cent., respectively, over a well-designed Stephenson link motion running in good condition." Much has been said regarding the Walschaert gear as being superior to the Stephenson link motion. If you will compare the record of the Walschaert gear on the New York Central locomotive No. 2,749 with the valve chart of the 581, you will find that, with the Walschaert gear at quarter stroke, pre-admission amounts to $^{11}/_{16}$ in., lead $^{3}/_{16}$ in., port ¼ in., cut-off 8⅛ in., release 22 in., or at 62.8 per cent. of stroke, closing for compression when the piston is within 10 in. of the end of its stroke, or at 62.8 per cent. of stroke. The New York Central engine has cylinders 23 in. x 32 in., and you will note that with the Walschaert gear there is the same early release of the steam from the cylinders and the same early closure of the exhaust port for compression, as under the Stephenson gear; therefore, the valve events being the same, the steam distribution must be the same with either Stephenson or Walschaert gear, and therefore there can be no particular difference in the steam economy nor is any economy in the use of steam possible in any other valve gear or any other system of steam distribution with early exhaust openings and closures.

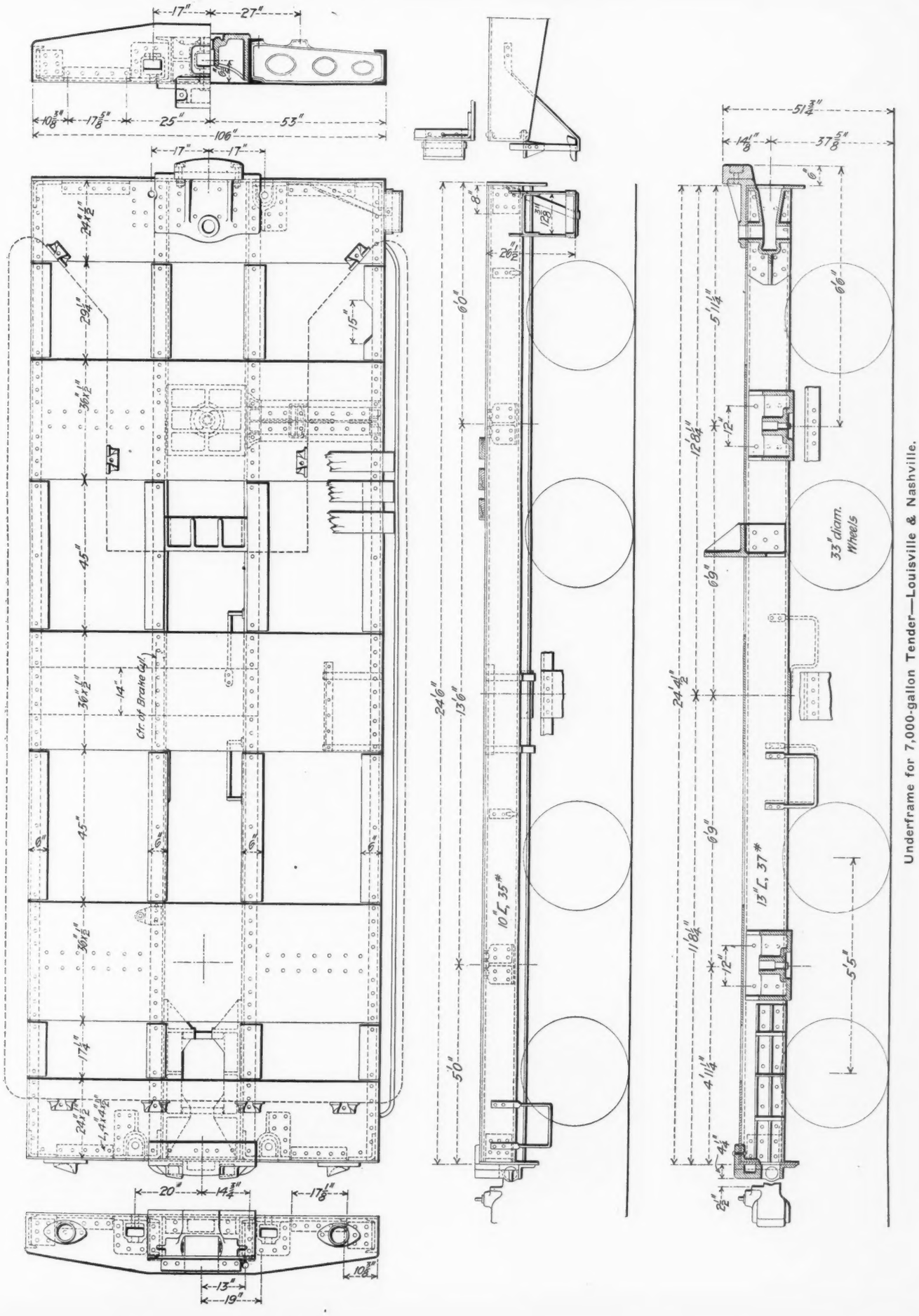
On the Central New Jersey, the No. 581 beat the No. 582 solely because of increased expansion, decreased negative work of compression, and reduction of waste in the cylinder clearance, all of which are regulated and controlled by the valve gear, and by the marked reduction in cylinder condensation possible in our system only.

IRA C. HUBBELL.

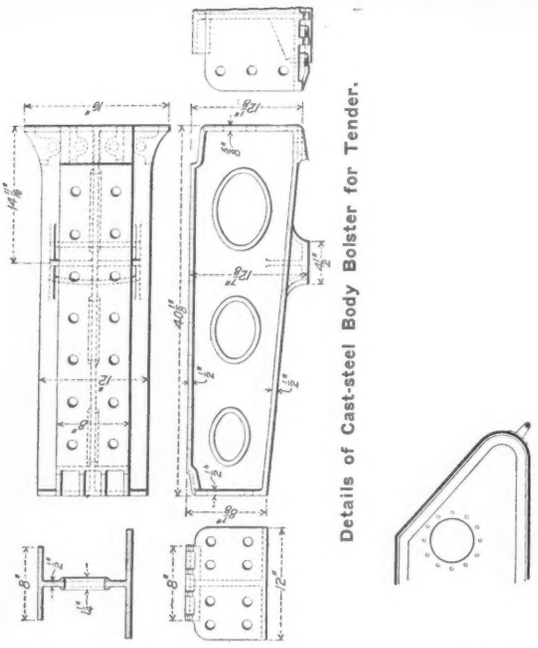
7,000-Gal. Tender of the Louisville & Nashville.

The 7,000-gal. tender illustrated herewith was designed by Mr. T. H. Curtis, Superintendent of Machinery of the Louisville & Nashville. It will be noted from a glance at the drawings that the sheets forming the coal space are so shaped as to insure all of the coal coming down to within easy reach of the fireman. In addition to its convenience in this regard, it avoids the accumulation of "old" coal. The easy curves—6-in. radius—of the $^{5}/_{16}$-in. plates will also be noted, together with the arrangement and relation of the sloping and vertical back sheets.

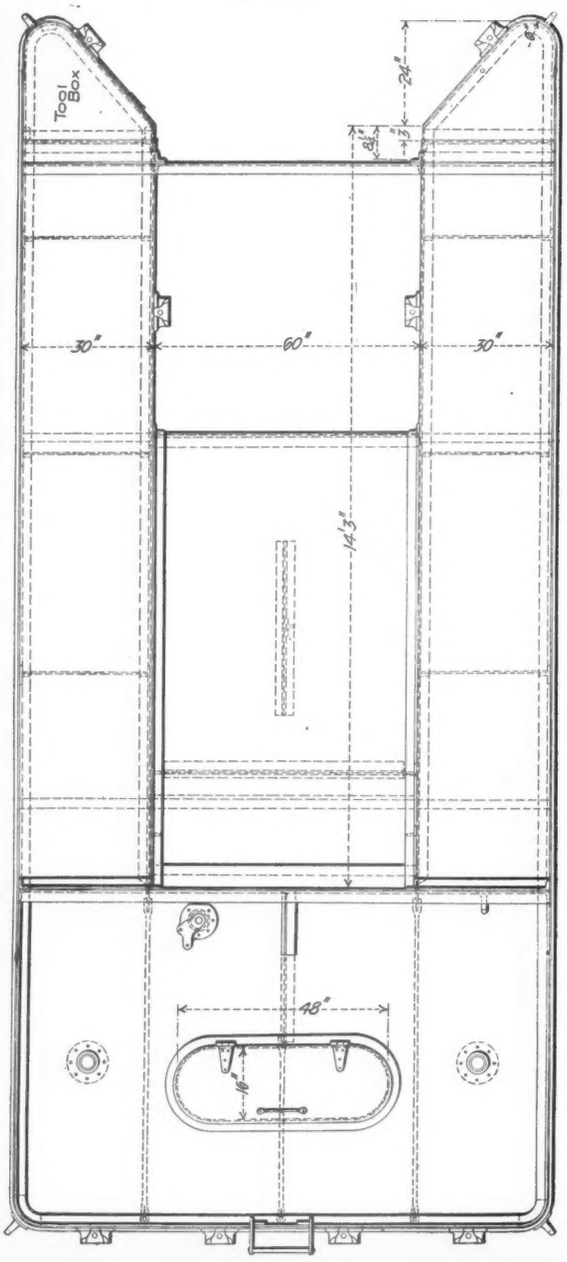
The bracing forward of the back line of the coal space is all by plates, angles and tees. The water legs are tied transversely by three plates secured to tees riveted to the side sheets. Two of these plates, which also act as splash plates, are 17½ in. wide, and the third and rear one is 34 in. wide. The sloping back sheet of the coal space is supported by a longitudinal plate 39 in. long, on the center line of the tank, stiffened by a tee. It is also stiffened higher up by a splash plate 12 in. wide extending transversely across it. The side sheets of the tank are stiffened longitudinally by two 2½-

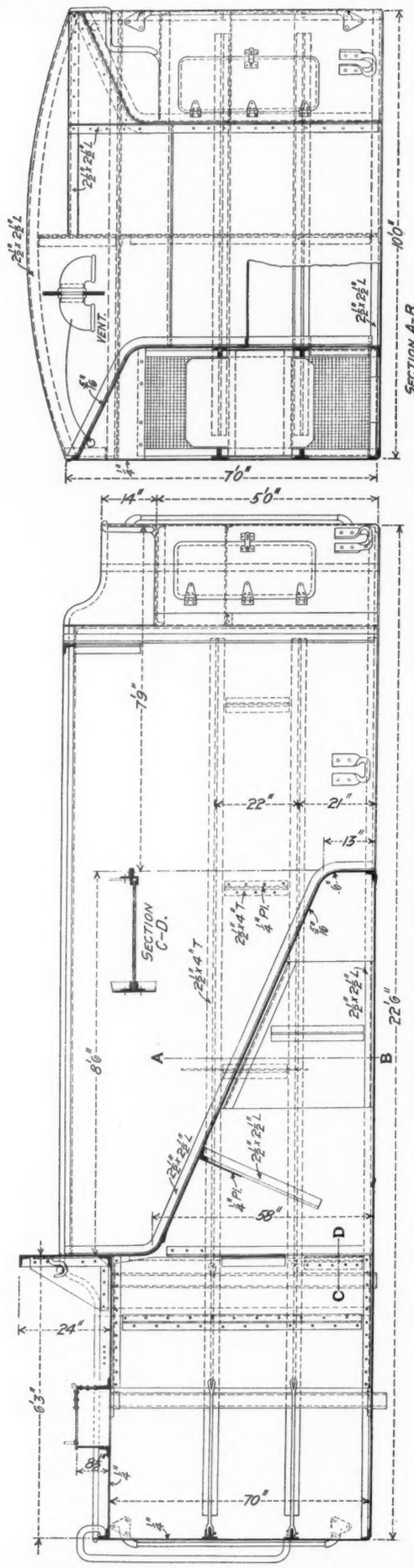


Underframe for 7,000-gallon Tender—Louisville & Nashville.



Details of Cast-steel Body Bolster for Tender.





Plan and Sections of Tank for 7,000-gallon Tender—Louisville & Nashville.

in. x 4-in. tees running their entire length. In the rear water space, on the center line of the tank, a longitudinal vertical plate 35 in. wide is riveted to the top and bottom sheets. This plate extends to the edge of the manhole. The space is also tied longitudinally by three pairs of ⅞-in. rods, the middle pair being shorter than the other two, and attached to the plate above mentioned. A 17½-in. splash plate extends across the tank at the rear of the water legs, 24 in. above the bottom. The entrance to each water leg is closed by a strainer of ¼-in. mesh, containing a door 34 in. high—large enough to admit a man.

It will be noticed that the front end of the left-hand water leg is stopped off by a transverse plate to leave space for a tool box or cabinet. This cabinet is closed by a door, as shown by the drawings. The coal is retained at the front end by a combination wood rack and chain gate 7 ft. high; the bottom part consisting of removable chains, and the top part being a permanent wood rack 30 in. high.

The steel underframe is of simple design and substantial construction. The center sills are 13-in., 37-lb. channels and the side sills 10-in., 35-lb. channels. The body bolster is formed of two duplicate steel castings of the form shown in the details, extending from side to center sills and riveted to both, and a separate casting between the center sills, the whole being covered by a ½-in. plate 36 in. wide. There is also a similar floor plate across the frame at the middle. At the ends of the frame there are floor plates 24 in. wide across on top of the sills, and to the ends of the latter are attached plates 11½ in. wide at each end and 17½ in. wide at the middle, stiffened with angles. All details of the frame are shown in the drawings.

The tank valve arrangement is a departure from usual practice. A circular pot 10 in. in diameter and 8½ in. deep is applied under the front end of the water leg on the right-hand side. Leading out from this pot are two 2½-in. pipes 6½ in. apart, terminating in the usual hose sleeve and nut. Each pipe contains a 2½-in. plug valve, the ordinary shut-off valve operated from above being entirely omitted.

The tender is mounted on two L. & N. standard 80,000-lb. trucks with built-up bolsters, 5¼-in. x 9-in. journals, 33-in. wheels and roller side bearings on the rear truck.

The Tennessee River Bridge of the Illinois Central.

BY H. W. PARKHURST.

One of the most important of recent improvement works of the Illinois Central has been the reconstruction of the bridge across the Tennessee river, on its main line from Louisville to Memphis and New Orleans. This was made necessary on account of the lightness of the old structure and its inability to carry with safety the heavy engines and trains now indispensable in moving the large traffic. The renewal has been accomplished by the construction of an entirely new bridge on a new site, as shown in Fig 1. The line of the railroad from a point about three-quarters of a mile southwest of

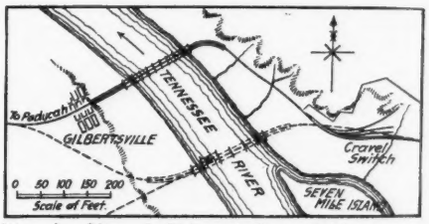


Fig. 1—Site of Old and New Bridges over the Tennessee River—Illinois Central.

the river was diverted and a new crossing made about half a mile further up the river, the diversion taking out nearly 120 deg. of curvature, and making the crossing of the stream more nearly at right angles with the current. The new bridge is about 5 ft. higher than the old, to give proper clearance under the new superstructure, but the grade on the approaches is light, being only 2-10 of a foot per 100 ft. The old bridge had a draw with two openings of 123 ft., while the new draw has openings of 198 ft., and it crosses at a more desirable point, both as to the location of the draw, and also as to the channel and the approaches to the opening. Serious objections had been made to the earlier bridge, and expensive sheer-booms were at one time ordered to be put in by the United States engineer officers in charge of the river, to satisfy the demands of the navigation interests, but the work was held off until the new bridge could be built, when modifications could be made to overcome the not unreasonable objections of the steamboat men.

In designing the new structure the utmost care was taken to see that an ample waterway was provided. The old bridge had about 900 ft. of trestle on each approach, built through timbered bottom land, and it might be thought that some of this opening could have been omitted. The Tennessee is, however, liable to sudden floods, and has a range of nearly 50 ft.; it was therefore deemed unwise to reduce the waterway to less than before. The new bridge was made to cover the whole width of the open stream, and the length of the approaches was adjusted to give an opening as nearly equivalent as possible to the original one. At the same time, the proper

Old Bridge of the Illinois Central over the Tennessee River, Built in 1888.

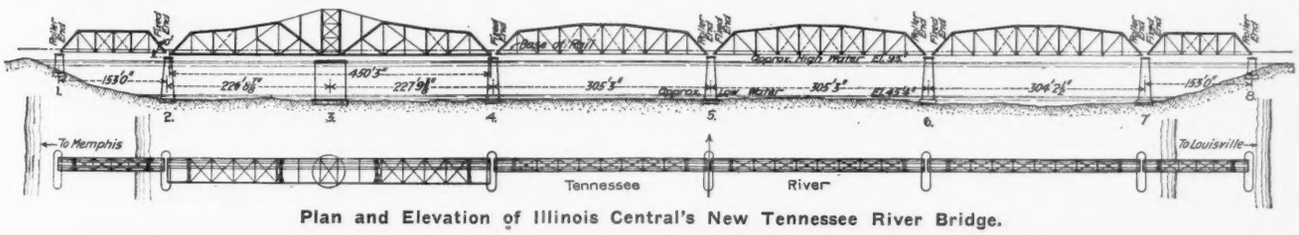
allowance was made for the longer spans and the less obstructed character of the new trestle work, so that the area of the new waterway is slightly less than before.

The original structure was built in about 1888, the superstructure plans being dated July 24 of that year. The spans were all of the "combination" type, but the draw had been replaced before the Illinois Central owned it; the plans of the present draw being dated February, 1894. The whole structure was designed for a comparatively light loading, viz.: two 90-ton consolidation locomotives followed by a load of 3,000 lbs. per linear foot. A fair allowance was made in addition for the dead load of the bridge and floor. The new spans are designed for two 165-ton consolidation locomotives, standing on 108 ft., followed by a load of 4,600 lbs. per ft., which is about twice as heavy as the old specification. Of course, the dead load of bridge and floor is added in the calculations for the new spans.

The consideration of how and when to replace this bridge was

New Bridge of the Illinois Central over the Tennessee River.

taken up early in 1902. Careful examinations were made of the piers and spans and estimates were made not only for an entirely new bridge, but these were compared with other estimates for rebuilding the old bridge under many different conditions. Owing to the great dissatisfaction with the old structure, it was probable that, if allowed to rebuild at the old location, a new and possibly a longer draw must be put in, and it might also be insisted that the draw be moved nearer the westerly side of the stream, where it would be more nearly in line with the channel. As the old piers had been founded on grillages only (no piles being used except in the west abutment), and as the old masonry was badly cracked,



Plan and Elevation of Illinois Central's New Tennessee River Bridge.

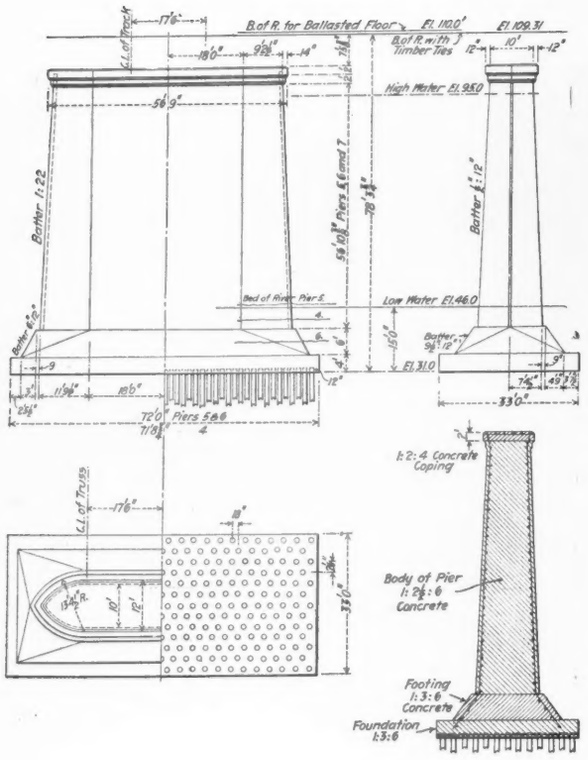


Fig. 3—Details of Piers Nos. 4, 5 and 6.

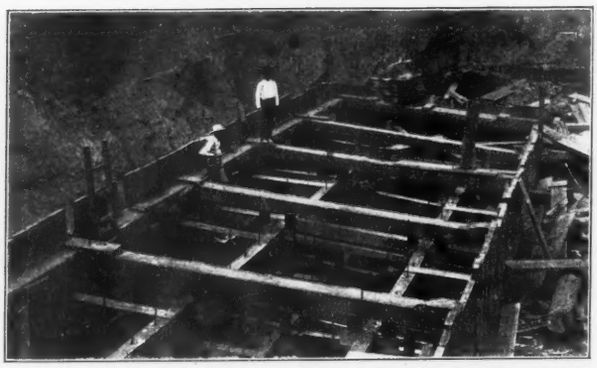


Fig. 5—Cofferdam for Pier 5, Showing Spacing of Corrugated Bars.

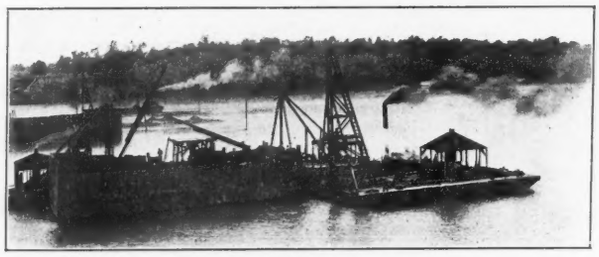


Fig. 6—Cofferdam for Pier 6.

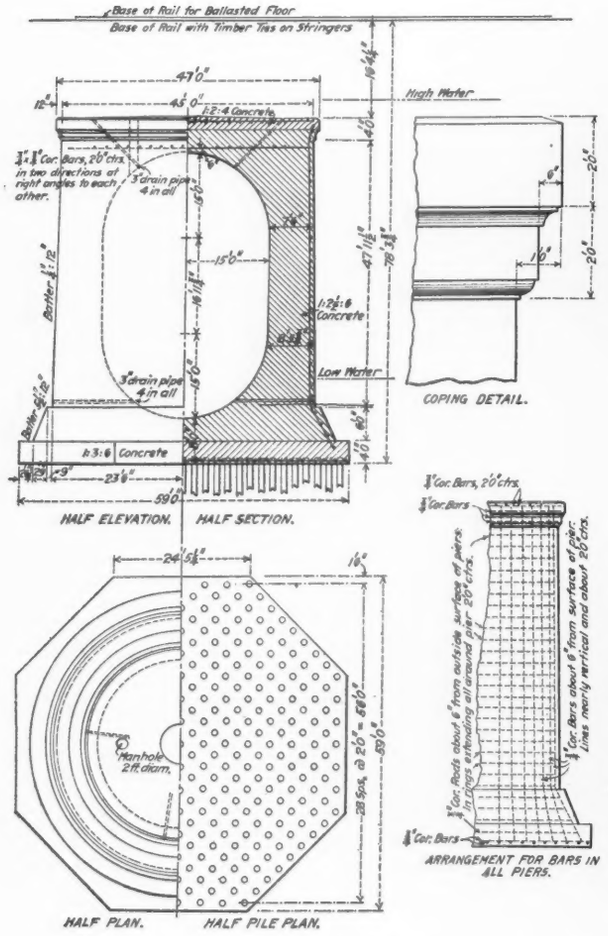


Fig. 4—Details of Center Pier for Draw Span.

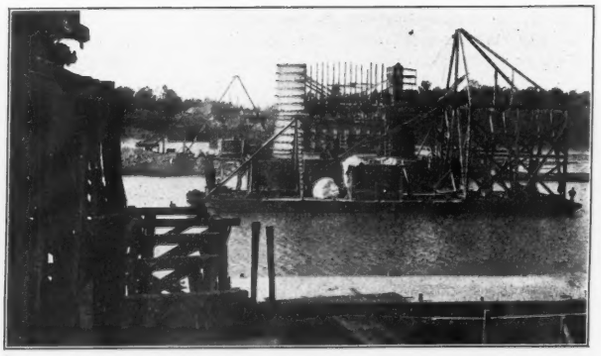


Fig. 7—Looking West from East Bank, Oct. 24, 1904.

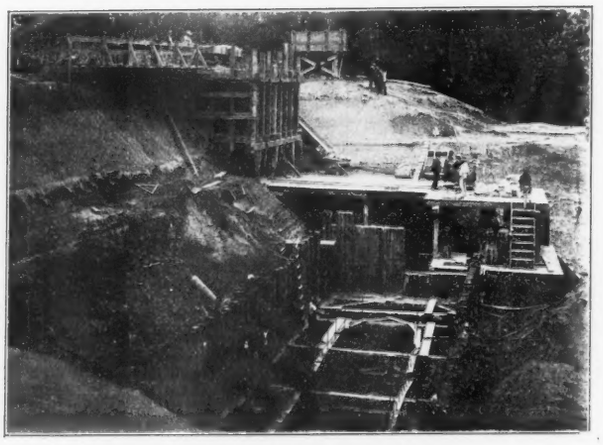


Fig. 8—Concreting Pier 1 on West Bank.

no method of repair was practicable (the piers being of sandstone), but to put on expensive jackets of concrete, and to reinforce the foundations with piles around them, to which more concrete must be added, to make a set of piers substantial enough to support even a single-track structure. A comparison of the estimates made upon the above basis showed that a new bridge throughout could be built for little or no more than it would cost to make the old structure thoroughly good. (And there would always exist the doubt as to whether the old piers could be made trustworthy.) It was therefore

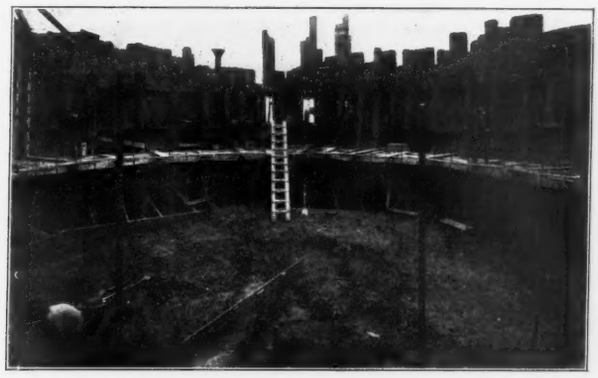


Fig. 9—Inside of Cofferdam for Pivot Pier.

practically necessary to build a new bridge, and plans for it, bearing date of June 6, 1903, were sent to the Secretary of War for approval. The formal approval bears the date of September 2, 1903.

A good deal of time was spent in determining just what should be built; that is, to what extent the structure should provide for carrying two tracks. While not needed immediately, the necessity would arise in the future, and perhaps at no distant day; hence it was necessary to make comparative estimates of the relative cost of converting a structure partly ready for two tracks into a complete double-track bridge. The estimates on these conditions being

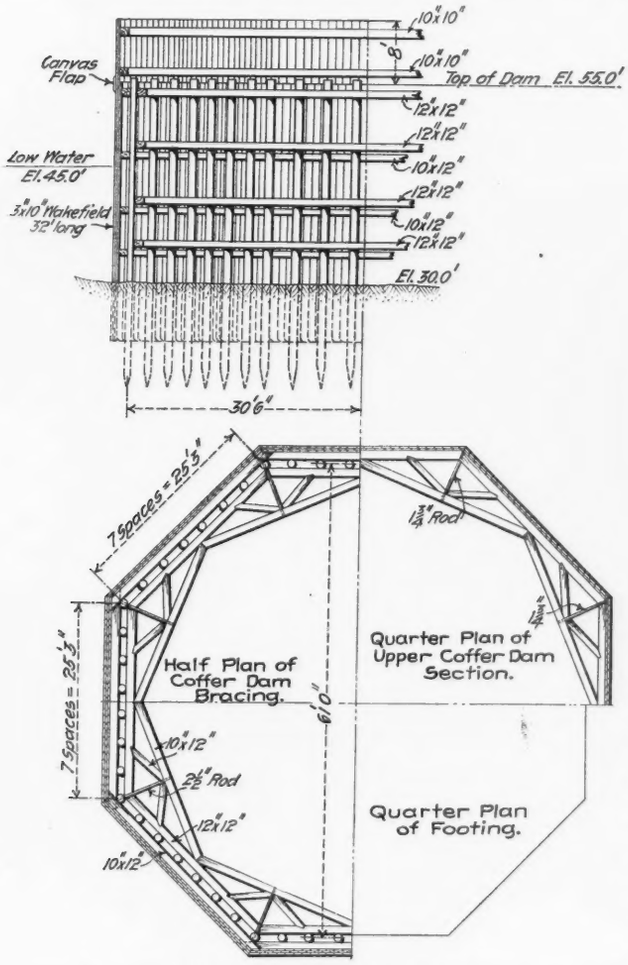


Fig. 10—Details of Cofferdam for Pivot Pier

completed, it was determined (1) to build the piers at once for a double track; (2) to make the fixed spans with one light and one heavy truss, and (3) to make the draw with two heavy trusses, leaving one floor only to be put in to make a complete double-track draw-span. This arrangement will permit conversion into a full two-track bridge without delaying traffic, and at a minimum of expense, and the resultant structure should be perfect for the service proposed. The first cost is kept as low as possible, considering that in the near future a second track must be had.

Substructure.—All the piers are founded on piles, borings in the center and on both sides of the river showing that the bed-rock was too deep to be reached by any reasonably expensive process. As the old bridge had no piles in the river, the thought may occur that this example could have been followed safely with the new bridge. But the experience with the old piers was sufficient to settle

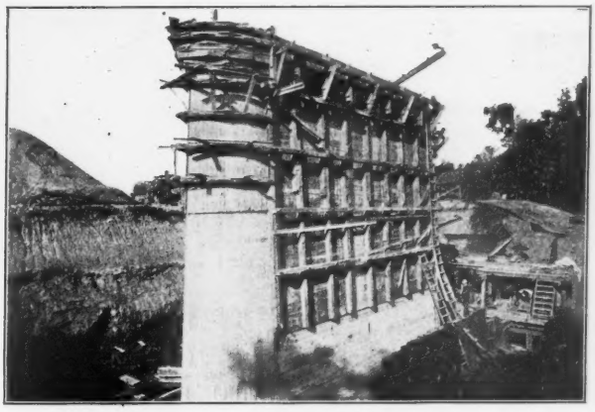


Fig. 12—Pier 1 Nearly Completed.

the question in the opinion of any one familiar with the bridge. While the material is mostly a heavy gravel, it has required large quantities of riprap to protect them from scour, and they have been all too easy to tip and to crack. The new pier foundations were carried well down into the bed of the stream, not only to give sufficient waterway without entirely omitting the use of riprap, but to safely allow a scour to take place, as it naturally will, around each pier. In spite of careful soundings and unlimited riprap, it has been known in one case that a pier actually slid off the hill of riprap on which it stood, and the two adjacent spans went into the river, stopping traffic on that bridge for weeks.

The dredging was generally done in advance of the pile driving,

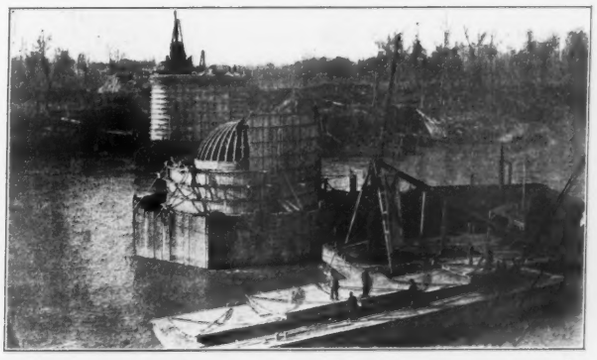


Fig. 11—Erecting Forms for Pivot Pier.

and before building cofferdams. The latter were put in, made up first of piles and then sheeting, and when the excavation was down, the piles under the pier were driven. The latter were cut by a circular saw mounted on a vertical shaft and set at the proper level to have the pile extend a foot or more into the concrete footing, making a bond with the same. As the excavation progressed, the bracing was set at the proper level in the cofferdam. Extensions of the cofferdams were made, generally at the up-stream end, for sumps, from which to pump the water. The dams were sealed, generally by depositing 2 or 3 ft. of concrete over the whole area by means of a bottom-dumping bucket, allowing it to set, and then pumping the interior dry by means of the sumps. Usually a 6-in. pump was ample to take care of the leakage, especially when a little calking had been done.

The piers were built of reinforced concrete throughout, Johnson corrugated bars being set in both horizontal and vertical lines, spaced in regular order, as shown in Figs. 3 and 4. These bars were intended to perfect the vertical bond, as well as to distribute

any stresses and prevent cracking of the surfaces of the concrete. It will be noted that there are horizontal bars at the tops of the piles, at the tops of the piers, and also above and below the open space in the center of the pivot pier. Fig. 5, the cofferdam of pier 8, shows the general manner of securing and placing these bars. This view also shows the general construction of the cofferdams, as do also Figs. 6, 7 and 8, the latter also showing the concreting plant at pier 1, on the west bank. Fig. 9 shows the interior of the cofferdam of the pivot pier, details of which are shown in Fig. 10. It has no cross struts in the center, the bracing being made efficient by means of a series of horizontal trusses around the inner side of the cofferdam, leaving the center nearly unobstructed. This is a novelty in the way of bracing. Fig. 11 shows the forms being erected for this pier.

The general arrangement of the concrete mixing and handling machinery may be seen from Figs. 6, 7 and 8, in which are shown the concreting plants at several of the piers. Some of this work was done in three shifts, and the record of 1,800 cu. yds. in 24 hours is considered quite good.

The construction of the concrete molds may be seen in Fig. 7 and also in Fig. 12, which shows pier 1 nearly completed. All molds were made of lumber having dressed inner surfaces, and the result, as shown by the illustrations, fully justified the additional expense. This is best seen in Fig. 13, and also in the view of the finished bridge.

A tabular statement is given herewith, covering the items and totals of the substructure, from which an idea may be formed of the magnitude of the work.

Table I.—Data for Substructure Work—Tennessee River Bridge.

Pier No.	Spans, length, lin. ft.	Excavation, cu.yds.	Cofferdams, size & M. ft., B. M.	Piles, No.	Masonry, Footings, cu. yds. 18x63 ft.	Masonry, Tops, cu. yds. 7x37 ft.	Corrugated st'l b'rs, lbs.
I.	150	6,300	90	144	370	885	12,100
II.	225	5,400	120 66 ft. oct. x 25 ft. high	305	873 59 ft. oct.	1,356 45 ft. cir.	16,200
III.	225	3,500	120 38 ft. w. x 78 ft. long,	410	1,254 33x72 ft.	2,290 10x36 ft.	20,300
IV.	300	3,800	25 ft. high. 125 38 ft. w. x 78 ft. long,	356	762 33x72 ft.	1,356 10x36 ft.	16,900
V.	300	11,000	23 ft. high. 125 38 ft. w. x 78 ft. long,	356	896 33x72 ft.	1,427 10x36 ft.	16,900
VI.	300	2,500	25 ft. high. 125	356	992 33x69 ft.	1,427 10x35 ft.	16,900
VII.	150	6,000	120	305	761 18x63 ft.	1,427. 7x37 ft.	16,200
VIII.		5,000	40	144	380	885	12,100
Totals	1,650	43,500	865	2,376	6,288 (17,341)	11,053	127,600

Time Finished.—Pier I.—Oct. 22, 1904; II.—Dec. 21, 1904; III.—Jan. 7, 1905; IV.—Dec. 24, 1904; V.—Dec. 17, 1904; VI.—Nov. 12, 1904; VII.—Nov. 26, 1904; VIII.—Sept. 24, 1904.

NOTE.—Sizes of tops of piers give length of the square, to the point of curvature. Points up and down stream are struck with radii as shown on plans.

All the substructure work was done by contract with the Bates & Rogers Construction Company, Chicago. The contract was dated May 21, 1904, and provided that the contractors should furnish a certain portion of the necessary plant, and should do the work on a "Force Account" basis, being paid a percentage for their services and allowing a bonus, as another percentage, should they finish the work before the stated time. The date set for completion was January 9, 1905, and as the work was finished on the second day of that month, the bonus was fairly earned. The exact cost of the substructure work has not yet been calculated fully, many minor accounts not being closed, but the contract work was done at approximately $255,000, this allowing for the contractors' percentages in profit and bonus, and making deductions for the salvage of tools, materials, etc.

Superstructure.—The contract for the superstructure of the Tennessee river bridge was included in a general contract for bridge superstructure let to the American Bridge Company, dated September 9, 1902, the work then being practically decided on, though no exact plan of length of spans had been settled on. The prices at

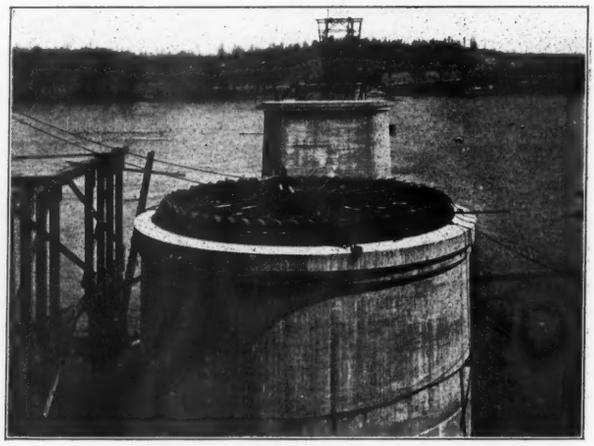


Fig. 13—Completed Pivot Pier.

which the work was let were: (1) for pin-connected trusses, $0.0364 per pound; (2) for draw-span, including turntable, $0.0445 per pound. It was stipulated that the railroad company should furnish all the detail plans, and that the manufactured material should be delivered at Chicago, or at some other convenient point on the Illinois Central Railroad. The contract did not include the erection work. The estimated weights of the bridge were as follows:

250 ft. spans	834,000 lbs.
300 ft. spans	3,960,000 "
Draw-span and turntable	2,200,000 "
Total	7,360,000 lbs.

Later estimates place the total at 7,520,000 lbs. No final estimate has yet been made, some minor matters being yet unadjusted.

The earlier plans for the new bridge were for a draw-span of 400 ft., four spans of 275 ft., and one of 250 ft., making a total of

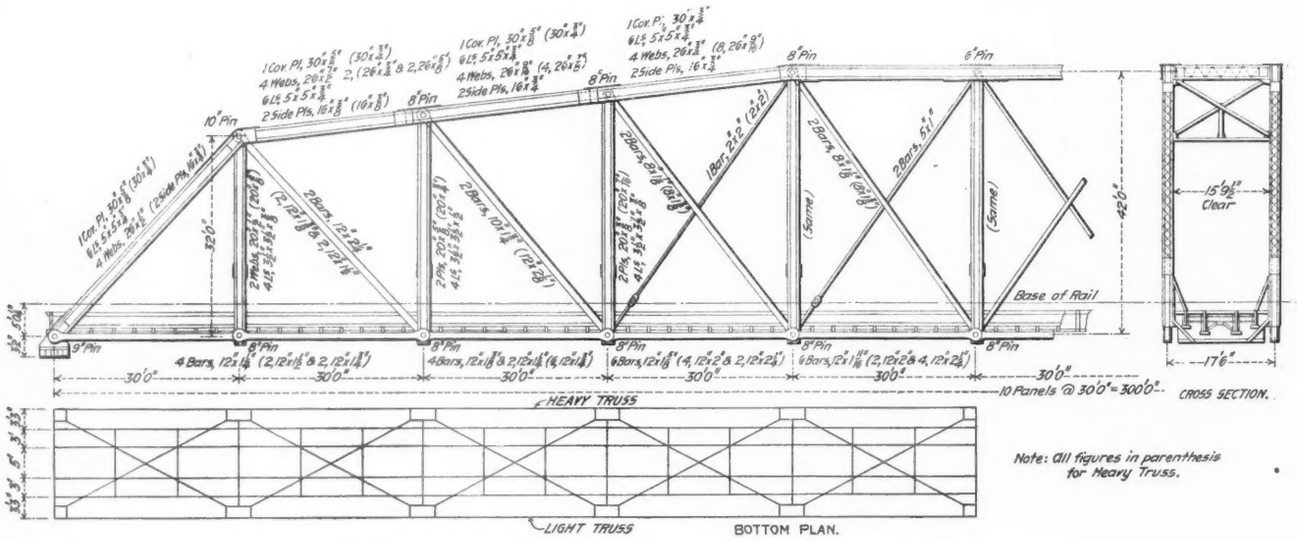


Fig. 14—Details of 300-ft. Fixed Spans—Tennessee River Bridge.

1,750 ft. This would probably have been a cheaper bridge to build than the plan actually used, but the United States engineers insisted on a longer draw, and the location of the channel and the width of river to be spanned made the plan of using 300-ft. spans with the longer draw of 450 ft. about as economical as the original plan.

The general features of the 300-ft. fixed span are shown in Fig. 14. There is nothing of special novelty about either of the spans. Details of the wedges for raising the ends of the spans are shown in Fig. 15, and the general plan and some detail of the center of the draw, and the machinery to operate it in Fig. 16. The spans are set in the following order: Beginning at the west end, one 150-ft. span, next the 450-ft. draw, then three 300-ft. spans, and last, at the east end, one 150-ft. span; making, inclusive of pier spaces, which vary

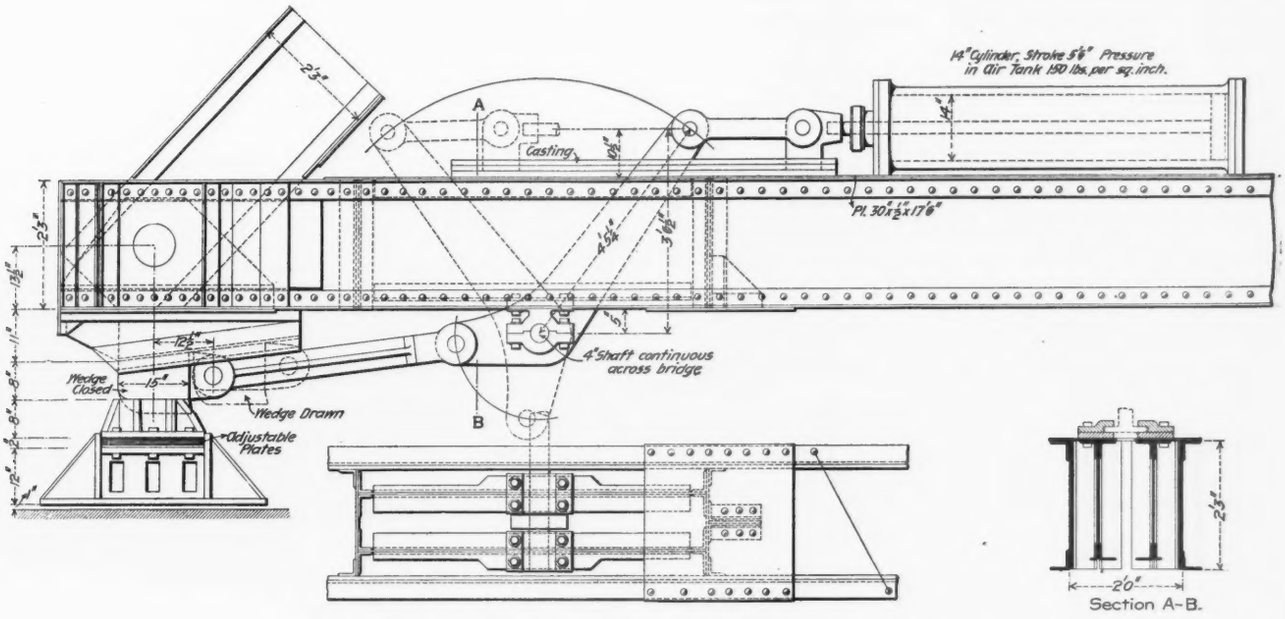


Fig. 15—Details of End Lift of Draw Span—Tennessee River Bridge.

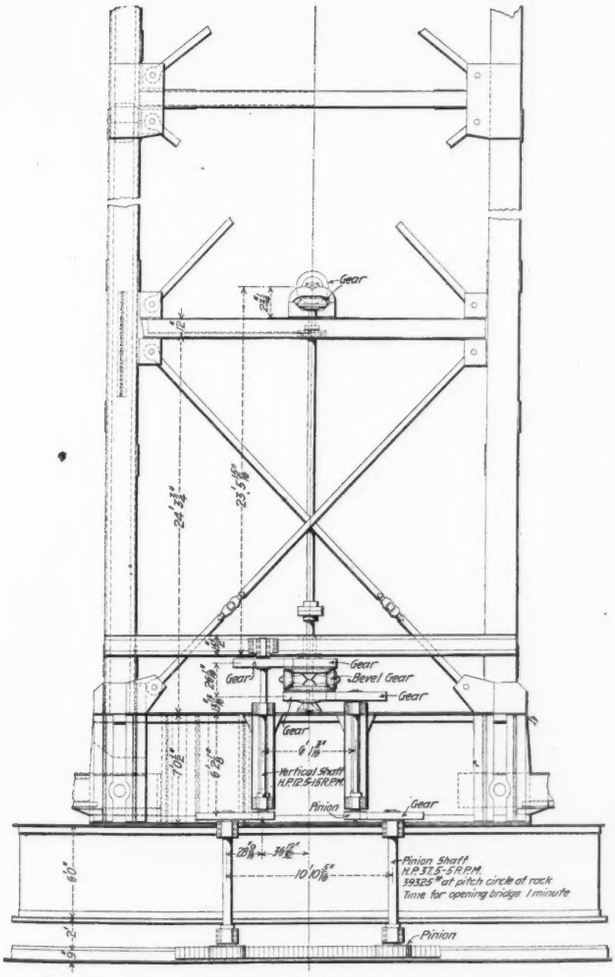


Fig. 16—Details of Turning Mechanism for Draw Span.

with the sizes of the spans, a total length of 1,675 ft., 2¾ in. from center of pin on the west to center of pin on the east piers.

The new bridge is about 50 ft. longer than the old, as to the steel structure. A comparison of the old and new bridges does not do justice to the latter, since the older picture was taken 14 years ago, when the earlier bridge was in its prime. It is now much less sightly, having an old Phoenix span in place of one combination span second east of the draw, put in to carry the track after a fire had destroyed a span, and the falsework used to erect it was left in till the old span should be removed. Drift has lodged in this falsework and is very unsightly. Then, too, 16 years of age are telling on the timber of the old bridge, and it would be serviceable for but a short time. For these reasons the views do not picture fairly the relative conditions. Then, too, the piers are deceptive, at the very least, to the casual observer. They were the main reason for building a new bridge. With their foundations placed at too high a level; with no piling under them to distribute the load, or to carry it to a lower and less uncertain stratum; with masonry of poor sandstone, already cracked, and likely to go to pieces at any time; with the chance of being undermined by any high water, when it might be impossible to riprap them, there was always a vast uncertainty about them, no one daring to vouch for their integrity, or regard them with confidence. They were known to have been moved more or less, and they might do so once too often. A steamboat had, and might again, run into one of them, and knock it off of its uncertain footing into deeper water than would be safe, and where it would be impossible to right it. Those piers were therefore sources of anxiety, and likely to bring discredit on any engineer who had to care for them. They are being replaced none too soon.

The wooden floor of the old bridge was another almost insuperable objection to rebuilding it. It was composed of 8-in. x 16-in. timbers, 18 to 20 ft. long, supported on I-beams built into the bottom chords, and not easily to be strengthened without uncoupling the spans. Figs. 17 and 18 show two views of this floor.

The contract for the erection of the bridge was let to the Kelly-Atkinson Construction Company, Chicago. It is dated November 21, 1904, and provided for the completion of the erection in 120 days from date, under a penalty and bonus clause of $50 a day, the saving or loss of one day being valued at that figure. The contract provided that if the draw should be erected leaving the opening through it for use of boats, the rate should be $23.50 per ton; but if the draw was closed, a rate of $1 less per ton would be fixed. The draw was left open, entitling the contractors to the larger rate. The work is not yet done at this writing and the contract limit has elapsed, but it is expected that the work will be done in the

next ten days. The tabular statement following gives the principal data of the erection work:

Table II.—Superstructure Erection Data, Tennessee River Bridge.

Spans.	I.-II.	Draw.	IV.-V.	V.-VI.	VI.-VII.	VII-VIII.
Piles for falsework, No...	25	180	88	88	84	25
Falsework, lin. ft.	150	450	300	300	300	150
Steel raised, tons	193	1,288	679	679	679	189
Riveting, No. rivets	3,798	.....	9,986	9,986	9,986	3,798
Painting, tons	193	.....	679	679	679	189
Work finished in 1905...	May 20.	Jun. 18,	June 1,	May 20,	May 13,	May 6.

It is not necessary to go into further detail, except to say that the erection has gone on in the usual way, being handled by a traveler

Fig. 17—Floor of Old Bridge.

running on falsework put up under each span in turn. Falsework piles were driven by a double driver pushed forward in front of the trestling, and piles were driven rapidly and easily therewith. A pneumatically-driven riveting plant was used throughout, much to the satisfaction of the engineers. The work went together in good shape, and the draw, which has been turned once by hand, fits well and is in fine adjustment. The turning of the draw verified the

Fig. 18—Under Side of Floor of Old Bridge.

layout of the engineers to ¼ in. The cost of the erection cannot be stated yet with any exactness, the work being still unfinished. It will, however, approximate $90,000.

The trestle work of the approaches deserves special mention, as it has some novel features, at least as an adjunct to a big river bridge. It was originally proposed to make an iron viaduct for this portion of the bridge, as is often done where permanent work is desired. But in this case the use of iron work was not desirable, since the approaches need not be double-tracked for any present service, and the time when two tracks would be essential was uncertain. Estimates were also made for building the approaches of concrete arches, and had there been any immediate use for two tracks on them, the concrete work would have been in high favor. Under the existing conditions it seemed inadvisable to go to a large expense for the approaches, and it was decided to make them of creosoted piling and timber, as being the just mean between the wooden or iron single-track trestle. The material of the trestle is all creosoted, and to make it safer against fire the floor is made nearly fireproof by filling in between the heavy ties with creosoted boards, making a tight floor, and then covering it with finely-crushed ballast to a depth of 1½ or 2 ins. This not only keeps the sparks off the wood work, but deadens the roaring noise which would otherwise be too apparent, and makes an easy floor to walk on and to maintain. A heavy guard-rail at the end of the 10-ft. ties will keep the wheels on the deck and also confines the ballast.

The work has been handled throughout by the bridge and building department of the Illinois Central Railroad. The general plans were all prepared in the offices of the company, and any details not prepared there were subject to their inspection and correction. The minor details of the substructure were made out by W. H. Torrence, who was at first Resident Engineer at the bridge. He was succeeded by H. H. Hadsall, who has carried the work to completion. The superstructure was designed by R. E. Gaut, then chief draftsman, now Engineer of Bridges, and the work is being finished under his general direction. As Engineer of Bridges and Buildings, the writer started the earlier estimates and work, but was succeeded Sept. 1, 1904, by F. H. Bainbridge, who was his assistant in the early stages. Mr. Bainbridge resigned his position on February 1 last, and was succeeded by Mr. Gaut.

The work therefore bears the impress of many hands, but it is an integral whole, without faults or misfits, and will do honor to all who were in any way connected with it.

Calculating the Cost of Handling Freight at Large Stations.

At the recent meeting of the Local Freight Agents' Association at Minneapolis, reported in the *Railroad Gazette* of June 30, page 757, the members again discussed the question, reported on in 1902, of classifying the expenses of a freight station; and, after a full expression of views, the convention adopted the classification which was reported by the committee in that year. This classification is as follows:

1. General Supervision. 2. Supervision and Clerical Work. 3. Labor.

General Supervision.

General foreman,	Assistant foreman,	Clerks,
	Watchmen and sealers.*	

The cost of General Supervision to be distributed pro rata between warehouses, platforms and team tracks, on basis of pay rolls for each separate place.

Supervision and Clerical Work.

Warehouse.	*Platform.*	*Team Tracks.*
Foremen,	Foremen,	Foremen,
Clerks,	Clerks,	Checkers,
Receiving checkers,	Loading and unloading checkers,	Sealers, and
Delivery checkers,	Watchmen and sealers.†	Watchmen.†
Loading and unloading checkers,		
Weighers,		
Watchmen and sealers.†		

Labor.

Warehouse.	*Platform.*	*Team Tracks.*
Loaders,	Loaders,	Laborers engaged in loading and unloading package freight on team track.
Packers,	Packers.	
Truckers,	Truckers,	
Coopers,	Coopers.	

*If the service of watchmen and sealers extends over all three departments—Warehouse, Platform, and Team Tracks.
†If not included under General Supervision.

Tonnage should also be classified as follows:

Warehouse Freight.—General merchandise received and forwarded; includes handling from cars to teams and from teams to cars.

Platform Freight.—Freight transferred at platform from car to car or checked from and returned to same car.

Team Track Freight.—Freight handled from cars to teams or taken from teams to cars when supervision, checking or labor is furnished.

To arrive at the total number of tons handled credit should be taken but once for the actual number of tons handled in receiving and disposing of the freight.

The cost per ton for handling is to be obtained by dividing the tonnage obtained as above into cost for labor at warehouse, platform or team track.

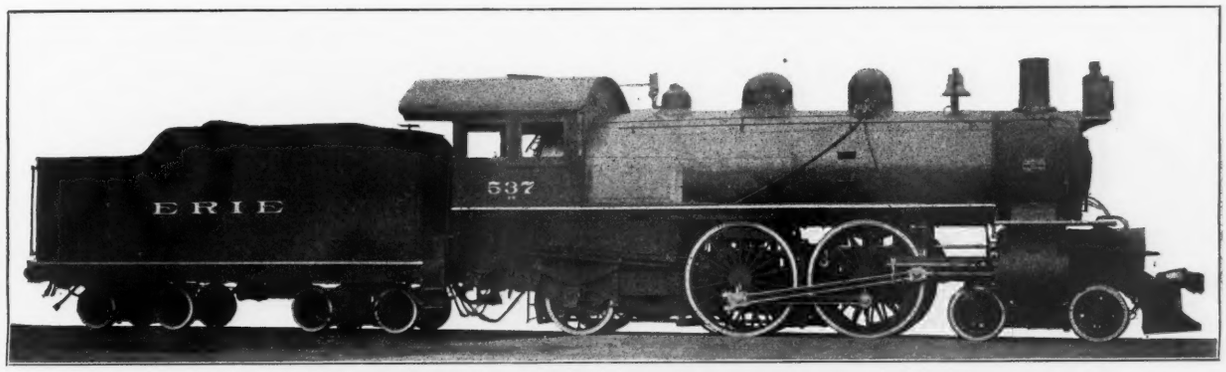
Total cost per ton for operation is to be obtained by dividing the tonnage obtained as above into the total cost for supervision, clerks and labor at warehouse, platform and team tracks.

Cole Balanced Compound for the Erie.

The American Locomotive Company has just turned out at its Schenectady works a 4-4-0 Cole four-cylinder balanced compound locomotive for the Erie, a photograph of which is reproduced herewith. It has the same size cylinders, 15½ in. and 26 in. by 26 in. stroke, as the original Cole compound for the New York Central built last year (see *Railroad Gazette*, May 13, 1904), but in many of the details it has been materially changed. The Erie engine has 115,000 lbs. on two driving axles and a total weight in working order of 206,000 lbs. This is 5,000 lbs. more on drivers and 6,000 lbs. more total weight than the Central's compound, and is, we believe, the heaviest weight yet put on a single driving axle. The perfect balance exhibited by the Cole compound on the St. Louis Exposition testing plant undoubtedly influenced the builders to increase the weight on drivers to this extreme amount. The Erie's roadbed is hardly up to the standard of the New York Central, and it will be interesting to see what effect, if any, this new engine has on lighter rails when running at high speeds.

The principal difference in appearance between the two locomotives is due to the fact that the Erie engine has been lengthened 1 ft. between the center of the low-pressure cylinders and the leading driving axle. The boiler has been lengthened correspondingly by inserting 17-ft. tubes instead of 16-ft. tubes. This permits the use of a longer inside connecting rod. The outside rods have not been lengthened, the additional distance being compensated for by extending the cross-head guides and lengthening the piston rods as in the Baldwin compounds. Some minor changes have been made in the valve and cylinder castings, notably leading the high pressure steam along the side of the valve casting instead of along the top.

In point of boiler power, this new engine surpasses the Central's compound. It has 56.3 sq. ft. of grate area as against 50.3 sq. ft., and 3,622.02 sq. ft. of heating surface as against 3,446 sq. ft., most of which is gained by the additional length of tubes. The Central Atlantic engines have proved to have ample reserve boiler power, and this engine should prove equally as satisfactory in this respect.



Cole Four-Cylinder Balanced Compound Atlantic (4-4-2) Type Locomotive for the Erie.

The accompanying table gives the principal dimensions of a recent de Glehn four-cylinder compound, the Cole compound of the New York Central and the Baldwin compounds on the Santa Fe. It will be seen that the Erie engine is the heaviest and most powerful engine of this type yet built.

	de Glehn.	Baldwin.	Central.	Erie.
Total weight, lbs.....	142,193	193,760	200,000	206,000
W't on drivers, lbs...	71,200	101,420	110,000	115,000
Cylinders, in. .....13.4 & 22x25.2		15 & 25x26	15½ & 26x26	15½ & 26x26
Diam. drivers, in....	80⅜	73	79	78
Total, htg. surf.,sq.ft.	2,274	3,083	3,446	3,622.02
Grate area, sq. ft....	29.6	49.5	50.3	56.3

The following table gives the principal dimensions of the Erie engine:

Kind of fuel	Bituminous.
Weight on drivers	115,000 lbs.
" truck wheels	91,000 "
" total	206,000 "
Weight, engine and tender loaded	368,800 "
General Dimensions.	
Wheel base, total, of engine	28 ft. 9 in.
" driving	7 " 0 "
" total, engine and tender	60 " 9 "
Height of stack above rails	15 " 2¼
Heating surface, firebox	188.47 sq. ft.
" " tubes	3,433.55 "
" " total	3,622.02 "
Grate area	56.3 "
Wheels and Journals.	
Drivers, number	4
Drivers, diameter	78 in.
Drivers, material of centers	Cast-steel
Truck wheels, diameter	36-in.
Journals, driving axles, size	10 in. x 12 in.
Journals, truck axles, size	6½ in. x 12 in.
Cylinders.	
Cylinders, diameter	15½ in. and 26 in.
Piston, stroke	26 in.
Piston rods, diameter	3 in.
Piston rod packing	Cast-iron rings
Valves.	
Kind of	Piston, 14 in. diameter.
Maximum travel	6 in.
Outside lap	1 in.
Inside lap or clearance	H. P. 3/16-in., L. P. ⅜-in.
Lead	¼-in. forward at 11 in. cut-off.
Boiler.	
Type of	Extended wagon top.
Working steam pressure	220 lbs.
Diameter of barrel, first ring	70¾ in.
Firebox.	
Length	108 1/16 in.
Width	75¼ in.
Thickness of sheets	Crown ⅜-in., tube 9/16-in., sides ⅜-in., back ⅝-in.
Water space, width	Front 4 in., sides 3½ in., back 3½ in.
Tubes.	
Number	388
Material	Charcoal iron.
Outside diameter	2-in.
Length over sheets	17 ft.
Other Parts.	
Exhaust nozzle, single or double	Single.
Exhaust nozzle, diameter	5⅜, 5⅜, and 5⅞ in.
Stack, diameter	18 in.
Tender.	
Tank capacity	8,500 gallons.
Coal capacity	16 tons.

A Railroad Clearing House.

In two recent circular letters J. W. Midgley reviews the work of the British railway clearing house, and discusses the adaptability of some such system to the conditions in this country. Parts of these letters follow.

The clearing system as applied to inter-line traffic in England has been on trial over 60 years. In 1842 complaints of the public of the inconvenience of being obliged to purchase tickets at each junction and arrange for the transfer of their goods to the next carrier, became so grievous that Mr. Kenneth Morison, who was Auditor of the London & Birmingham Railway, evolved a remedy, and bringing it to the notice of prominent railroad officers, induced them to join in what, in this country, is termed through ticketing of passengers and through way-billing of freight. To carry out the arrangements and duly distribute the proceeds between the participating companies Mr. Morison organized a bureau with a small staff of clerks, and located the same in a modest house in Drummond street. The supervising body was called a committee, and to the latter reference is made in the Clearing Act which was passed by Parliament in 1850.

Similar steps were initiated in this country in the case of passengers, through the intelligent action of general ticket agents of connecting lines; and later, a similar work was inaugurated, scarcely less beneficial to the public, in the through way-billing of freight and its transportation for long distances without breaking bulk by the establishment of co-operative or fast freight lines.

But when English railroad managers experienced difficulty in enforcing contracts to distribute gross earnings arising from the through (or continuous) transportation of passengers and freight, all they had to do was to petition Parliament for the requisite authority and it was conferred in what was termed the Clearing Act. This was procured largely through the efforts of George Carr Glyn, Esq.—afterward called Lord Wolverton. He was Chairman of the London & Birmingham Railway, with which company Mr. Morison, the first Secretary of the Clearing House, had been connected as Auditor. The Clearing Act was amended in 1897 in accordance with the desire of interested railroad companies, and the institution has proved so beneficial that it is regarded with a favor which would hardly be comprehensible in this country.

As a matter of fact, credit for the initiation of the clearing system is not due to the railroads of England but to the banks. It was from the latter that Mr. Morison derived the suggestions which he induced his colleagues to apply to inter-line traffic. The following outline of the growth and objects of the English Clearing

House is taken from an official pamphlet issued in London in 1901.

In 1838 it became evident, when the railroads which extend from London to Liverpool had been completed and connected, that arrangements must be adopted to facilitate the passage of through traffic at the points where the three railroads joined. It was found that not only must passengers be permitted to make a continuous journey without being required to change their carriage, but that a similar rule must govern every description of through traffic. The change of carriage, with its attendant worries in connection with baggage, the transferring of goods, with the loss of time and increase of risk, were characterized as the "evils of the system," the "supineness of railroads," and the "results of monopoly."

Thereupon, the directors of certain railroads tried to comply with the requirements of the public. Mr. Kenneth Morison and Mr. Robert Stevenson conceived that a central office, constituted on a similar plan to that of the Bankers' Clearing House, would furnish a remedy. This plan was submitted to Mr. Glyn, who saw its advantages and set to work to perfect it. This was not done without surmounting many obstacles. Those who feared their dishonest gains would be curtailed fought vigorously against it; some opposed it because it involved trouble, others upon principle—the universal one—that it was new. The more he considered the practicability of the idea the more Mr. Glyn became convinced of its necessity, and he agitated and argued for it. At length the various difficulties were surmounted, and on the 2d of January, 1842, the system of the Railway Clearing House came into operation on the railroads extending from London to Darlington in one direction, and from Manchester to Hull in another.

The wisdom of its promoters was soon exemplified, and through traffic began to be worked with facility, economy, despatch and justice. As stated by Mr. Morison, the Clearing House had its origin in the desire of the railroad companies to further their own interests in the only way in which those can be effectually promoted or permanently secured—by consulting public opinion. It has grown with the growth of the railroad system, and unless the public accommodation be restricted and the exigencies of the commercial, manufacturing and agricultural interests be disregarded, it must advance to the limits to which continuous communication by railway extends.

This recital may be interrupted to note another difference between conditions in England and in America. The managers of English railroads are not only at liberty to agree upon uniform methods and regulations to govern the transportation of passengers and freight, but they have the sanction of law so to do. Furthermore, by means of the Clearing House, the classification of freight which governs throughout the United Kingdom is formulated and revised. In like manner, schedules of rates are agreed upon, whether for through line or competitive traffic. Thus, while companies retain the independent right to establish all tariffs, those are usually made by agreement with rival companies through the Clearing House.

Such procedure as the one just described is prohibited in this country. The construction placed by the Supreme Court upon the anti-trust law forbids common carriers associating to agree upon rates, notwithstanding those should be reasonable. It was held in the trans-Missouri case that it would be a restraint upon trade for the Association (composed of roads operating west of the Missouri river) to meet at stated periods for the purpose of formulating uniform rules, rates and regulations to govern the transportation of traffic over their respective lines. The decision was affirmed in the case of the Joint Traffic Association—an organization of the trunk lines and affiliated roads operating between North Atlantic seaports and Mississippi River crossings. Attempts of railroad companies to act together or agree upon uniform rates were declared to be in violation of the anti-trust law.

As one of the main purposes of the English Clearing House is to promote uniformity and agreement between carriers—which are admittedly in the interest of the public—it is manifest that similar advantages cannot be assured in the United States until a modification of the existing prohibition is obtained from Congress.

Returning to the English organization, it appears that during the first five years, only passenger traffic, and that in small parcels, were handled by the Clearing House. Goods were carried "by toll" —in some degree analogous to the express system of the United States. At the end of that period arrangements were made for assessing the proportionate charges for goods traffic, and crediting the various companies for the use of their rolling stock.

After the death of Mr. Morison, Mr. P. W. Dawson was appointed Secretary of the Clearing House. The clerks employed by the Secretary not only officiate as accountants, but perform in many respects the functions of bankers. All balances due on accounts sent to Seymour street are paid in, no delay being allowed for clearing alleged errors or disputed points. All inter-line business is settled there, and accounts are eventually balanced to a farthing. So prompt and thorough are the methods employed that provisional settlements of reasonable accuracy are made with all lines before the end of the succeeding month. The annual clearings approximate $150,000,000, and not being conducted for profit there is never a surplus nor a deficiency. The Clearing House is conducted at a total annual cost of about $150,000. Where great differences of opinion occur they may be carried forward for future settlement, or a suspense account may be opened; but in no case can the decision of the Clearing House be resisted. By the Act of Parliament which created the institution, anything declared due by it is legally due and must be paid.

The governing body is composed of a delegate from each affiliated company—often the Chairman of the company, but always a Director. The committee of delegates meets every quarter. From its own body it appoints seven members as a Committee of Superintendence, meeting monthly, and it is to this body that the Secretary makes his report every month.

Reverting to the Clearing Act, which is stated to have been necessary owing to the inability of the committee to enforce payment of amounts declared due, it is not clear why difficulty should have been experienced in that respect. If the reference had been to balances for service performed pursuant to contract, no trouble should have been experienced in enforcing the same. For example, if three companies form a continuous through line, each one is entitled to its agreed share of the proceeds for the transportation of passengers or goods, as the case may be, and could enforce collection. The presumption is that the committee in charge of the first clearing house was not authorized to initiate legal proceedings, but the individual companies could not have been debarred from their inherent right of action.

The point sought to be made is an important one. Parties are apt to infer that clearing houses for the settlement of inter-line accounts could not be maintained unless they were specially authorized by Federal statute. That belief grows out of the fact that pooling contracts were not enforceable at law. There is a distinction, however, between the latter and agreements for the division of gross receipts among parties to a through or continuous line. In the first case, responsive to inquiry from a Parliamentary Commission, the Solicitor General expressed the opinion that a stockholder could enjoin the company in which he was interested from paying monies (for services it had rendered) to a competing line, which latter had really not earned the same. In other words, if there were two rival roads operating between given points, that had agreed to divide the gross proceeds of the traffic via both lines in equal proportions, and one should carry only 40 per cent., then a stockholder could enjoin the excess line from paying 10 per cent. over to the other in order to make good its shortage for a service it had not rendered.

An American clearing house need not seek any such arrangement. It would suffice for it to provide for the distribution, in accordance with prior agreement, of the gross earnings for the through transportation of passengers or goods over a continuous or through line which may be composed of two, three or more connecting carriers. There would, necessarily, be many such transactions during one month, and as the settlements would not be made oftener than monthly, the clearance idea involves disposing of the same by one balance sheet instead of many. Manifestly, to do that does not require any authority of law, because it would in no wise concern the public—neither would the rights or interests of a stockholder in either company be affected; and in any event the authority of the individual companies to recover one from another would not thereby be vitiated or diminished.

Furthermore, there is small likelihood of litigation between railroad companies as to the settlement of accounts known to be justly due. It is a matter of common knowledge that the adjustment of joint coupon-ticket accounts, inter-line freight accounts, mileage and other accounts between railroad companies are regarded as debts of honor, and that drafts therefor are paid on presentation; and correction, if need be, is made in accordance with subsequent revision. This will serve, therefore, to indicate one marked difference which may be drawn between the English Clearing House and any similar organization that may be undertaken in this country. The latter would not require the assistance of Congress, and so far as I can judge, need not be chartered or incorporated, because it would simply contemplate an economical adjustment of accounts between interested railroads, the same as is daily performed by the banks in leading cities of the Union through their clearing houses.

As showing the difference between the operations of a Bankers' Clearing House and those of the English Railway Clearing House, the following statement by the present Secretary, Mr. Harry Smart, will be interesting:

> The work of the Bankers' Clearing House cannot well be taken into comparison with that of the Railway Clearing House. The former deals in already-made (possibly already lost) material (cheques), and can at once declare a balance; while here, before we are in a position similar to that of the Bankers' Clearing House, we have to perform various complex operations, such as receiving particulars in duplicate both from the forwarding and receiving stations, reconciling differences (a delicate task at times), condensing the items, ascertaining the debit of the cash-holding company, apportioning to each company its agreed share of receipts, preparing accounts showing the details required by the companies, and ascertaining the balance due to or by each company concerned in the month's transactions. These operations here precede the preparation of a balance.

Mr. Smart also explains, as follows, the departments into which the Clearing House is divided, and the manner in which work is conducted:

The London staff is organized in departments, with an Assist-

ant Secretary and four other principal officers; these are separated into divisions, with a chief clerk to each, and those again are subdivided. In the main office there is the Secretarial Department; the Merchandise Department—which is the largest and of great importance; the Coaching Department—comprising the passenger traffic and parcels and miscellaneous traffic; and the Mileage and Demurrage Department—which controls also the number-taking staff.

The Merchandise Department is one of the largest working offices in London, providing accommodation for about 1,000 clerks. Its purpose is the monthly apportionment of the receipts from the conveyance of goods, coal, coke and other minerals, and from cattle traffic—that is, traffic carried in goods, coal, and cattle trains as distinct from passenger trains, using more than one line of railroad in transit. With local traffic, except where traffic is the subject of agreement, it has nothing to do. To enable the Clearing House to make its settlements, it is supplied with monthly returns from stations of the totals of all invoices; these returns show the weight of the goods, and whether carried at rates which include collection and delivery or simply from station to station; the amounts "paid" and "paid out" at the forwarding station, and "to pay" at the receiving station. The returns show also the numbers and owners of the vehicles in which the traffic was conveyed. Separate returns of forwarded and received traffic are made by each station, and these are so sorted that the outwards returns of the forwarding station can be easily compared with the inwards returns of the receiving station; discrepancies are then adjusted by correspondence and the corrected totals transferred to "settlement" forms.

Next comes the calculation of what are known as "terminals." These are fixed sums allowed to the forwarding and receiving company for work done; but there are thousands of cases in which special or exceptional amounts are allowed by agreement between the companies, and all these have to be borne in mind by the clerks dealing with the returns. After deducting the terminal allowances and "paid on" amounts (amounts paid out by or allowed for some special service to the forwarding company) the remaining receipts are divided among the companies in the ratio of the mileage traversed, or in any other way that may be agreed. Frequently some doubt exists as to the route of the traffic, and then reference is made to the records of the Mileage Department and the exact route traced by means of the car numbers shown in the number-takers' returns. But the division of receipts is not always the simple matter that might be supposed. The Clearing House has to keep in view the numerous complicated agreements existing between companies, as well as the immense number of working arrangements made to facilitate the movement of traffic in all parts of the country; and when, in conjunction with these, disputes arise the Clearing House divides the undisputed portion of the receipts, holding the remainder in trust until the disputants agree.

The division of receipts having been completed, the next operation is the making up of monthly accounts for each of the companies. The account constitutes for each of the companies a permanent record of its entire monthly transactions, the final summary showing in one figure how much money is due to or from the company in respect of all such transactions. The account also shows how much cash is due to the company from each of its station agents, so far as traffic settled through the Clearing House is concerned. The earnings from "light traffic"—that is, traffic which in any month between a pair of stations in either direction does not exceed a certain fixed sum—are not divided in detail, but are apportioned in ratio to the results of the accurate division of the heavier traffic receipts in corresponding groups or partnerships.

The British railway clearing house plan could readily be put in use in this country for dividing the earnings on through coupon passenger tickets. Mr. Midgley describes the working of the English office as it was in 1898. For the great mass of through tickets, an English road reports to the clearing house the receipts, less its own share; but in the case of certain excursion tickets the whole fare, through, is reported, and is divided by the clearing house. Forty clerks are employed to assort the taken-up tickets, and in the summer a million such tickets are handled in a month. The number of settlements in a year is 7,500,000, and the money value of these tickets, $25,000,000. The whole staff of this department numbers 350. The clearing house also keeps the accounts of the through parcels traffic. Only approximate divisions of earnings are made monthly in this department, exact figures being made up only twice a year. There are 4,000,000 settlements yearly, and the traffic amounts to $10,000,000; 350 clerks are employed.

The Mileage department adjusts the compensation for interchanged freight cars. This department has its own number-takers at every important junction and keeps its records independent of the local agents. The number of cars sent from home to foreign roads monthly, including passenger cars, is over a million. Ordinary freight cars of capacities of not more than 10 to 20 tons each are charged at a rate of about one cent a mile. This is for a certain agreed limited time, and if the car is held beyond that time a penalty of 3s. a day is assessed. On cars of 15 tons capacity this rate is doubled; 20 tons, doubled again; 30 tons, 20s. a day. Penalties are also enforced for diversion. Mr. Midgley says that no demurrage is charged against consignees. The clearing house enforces payment of all its demurrage bills, because it has in its possession money belonging to the delinquent road, but the delinquent may appeal to the owner of the car. The Mileage department has about 400 clerks and 500 number takers.

The Secretary's department of the clearing house keeps records of the 400 or more meetings held each year; conducts a deposit bank for employees, and issues an elaborate hand-book of stations, with an official map and diagram of routes. In these publications about 1,250,000 distances are recorded. The hand-book of stations shows the accommodation provided at each station for the different kinds of traffic. Mr. Midgley calls attention to the fact that the Trunk Line Association, with headquarters at New York; the Central Freight Association; the Southern Freight Committee, and other bodies, would afford suitable foundations on which to build up clearing houses in this country. In the making of joint tariffs much time and expense could be saved.

Clearing House Not Needed.*

With the development of railroads in the United States the interchange of traffic between the various roads necessitated the devising of appropriate methods of interline accounting. The problem was a difficult one because of the great number of roads to be dealt with; the vast amount of territory covered; and the variety of accounts to be considered. . . .

As the general use of coupon tickets has enabled the railroads to ticket passengers over many roads on one ticket, issued at the point of departure, so the general use of standard forms and approved methods has made it possible to forward freight to any point in the United States, Canada or Mexico, over several roads, on one waybill. The American system of railroad accounting enables two or more roads to transact their joint business, retain full and exclusive possession of their records, and settle balances promptly.

Something has been said of late about the establishment of a general railroad clearing house for the settlement of interline freight, passenger, car, claim and other accounts, modeled after the English system. A comprehensive understanding of the problem in all its details will reveal the undesirability of this as well as its increased cost. A synopsis of the methods employed in handling some of the principal interline traffic accounts will serve to illustrate their simplicity, as well as the effective and economical manner in which settlements are made.

When freight traffic is way-billed through over two or more roads, the accounting officer of each road interested in the revenue is furnished with manifold copies of the waybills made from day to day, thus enabling him to critically examine the individual transactions, and in connection with junction reports showing the traffic passing to and from his line, to fully protect the revenue of his company. These waybills and reports constitute a permanent record of the business. The original waybills are verified at destination and examined in order that any changes made en route, such as weighing, inspection, etc., or on account of errors, may be passed upon. In the event any changes have been made, a correction notice is sent to each road interested in order that its records may be completed.

Statements of the business are compiled by the destination road, manifold copies being made for the roads interested in the revenue, which is apportioned to the several companies. These abstracts are accepted as rendered, and settlement of balances made by sight draft not later than the 25th of the succeeding month, any errors being adjusted in subsequent settlements. Thus, each accounting officer is enabled to determine the revenue accruing to his company from interline waybilling at the earliest possible moment and is in possession of all the data necessary for the compilation of required statistical information.

Economical and successful management depends largely on the promptness with which the results of operation are ascertained. Furthermore, the requirements of various states are very exacting in connection with the statistical information which they demand at stated intervals, often soon after the end of each month, under penalty of heavy fines. Time is an important factor and it is only through its most economical use that the accounting officers are enabled to meet the requirements in this particular. This is especially true on the larger roads and systems traversing, as many of them do, several states.

Correction notices and statements of interline account are made up at one writing, the use of carbon paper obviating duplication of work. The accounts upon which freight settlements are based are made up by the destination road, and as the traffic moves in

*This paper describing the manner of settling interline accounts between railroads in the United States, Canada and Mexico, was prepared by a committee of the Association of American Railway Accounting Officers, and unanimously approved by the Association at its meeting held in New York, June 30, at which over 200 of the principal accounting officers of American railroads were present.

both directions the expense and labor of writing up the accounts is thus equitably divided.

The apportionment of the revenue from interline ticket sales and the settlement of balances by sight drafts are accomplished promptly without friction or duplication, as are the freight accounts, and almost as early. By a similar process reports of car service (per diem and otherwise) and interline freight claims are exchanged and balances settled by sight drafts.

It has been claimed on behalf of a railroad clearing house that it would lessen the number of drafts, bills and vouchers required to be made. Under our system the number of drafts is reduced to the minimum, and few if any bills or vouchers are necessary, and the labor and expense incident to the actual making of the settlements is so small that a separate agency to handle them must necessarily increase the cost.

It has been claimed that a clearing house would facilitate and expedite the settlement of interline accounts and do away with much duplication of work. This is directly contrary to the fact; it would involve both delay and increased cost. It has also been compared to the various bank clearing houses which exist in the great commercial centers, but that any similarity could exist between a general railroad clearing house and a bank clearing house, is fallacious on its face. Bank clearing houses are limited to the city in which they are located, while railroads extend from one end of the country to the other. Business to be settled through any bank clearing house can be assembled at a moment's notice, while it would take days to assemble the business which it is sought to settle through a general railroad clearing house. Furthermore, the bank clearing house disposes of its transactions daily through the intervention of the parties directly interested and the items which enter into its settlements do not have to be subdivided or apportioned, whereas the business which would be settled through a general railroad clearing house would be composed of innumerable items from railroad companies widely separated.

If, in order to obviate this, clearing houses were established in different sections of the country the delay of final settlements and the expense would be still further increased, as it would necessarily involve inter-accounts between the various clearing houses, thus further duplicating and delaying the work. The necessity of continually referring to the various accounting departments and to the agents, regarding particular items in the accounts which require explanation, would still further complicate and retard the work.

In support of the contention that the establishment of a general railroad clearing house is desirable reference has been made to the Central Railway Clearing House at Buffalo, and the Star Union Line at Pittsburg. As a matter of fact these are simply adjuncts to the accounting departments of affiliated roads and accomplish only such results as are as quickly and economically worked out by the accounting departments of many companies similarly situated.

To sum up:

First.—The expense of the traffic department of the English Clearing House is approximately 1 per cent. of the revenue handled. A similar institution in America would be an almost wholly additional expense to the railroads which now do all their accounting (including revenue, disbursements and statistics) for less than 1 per cent. of their earnings.

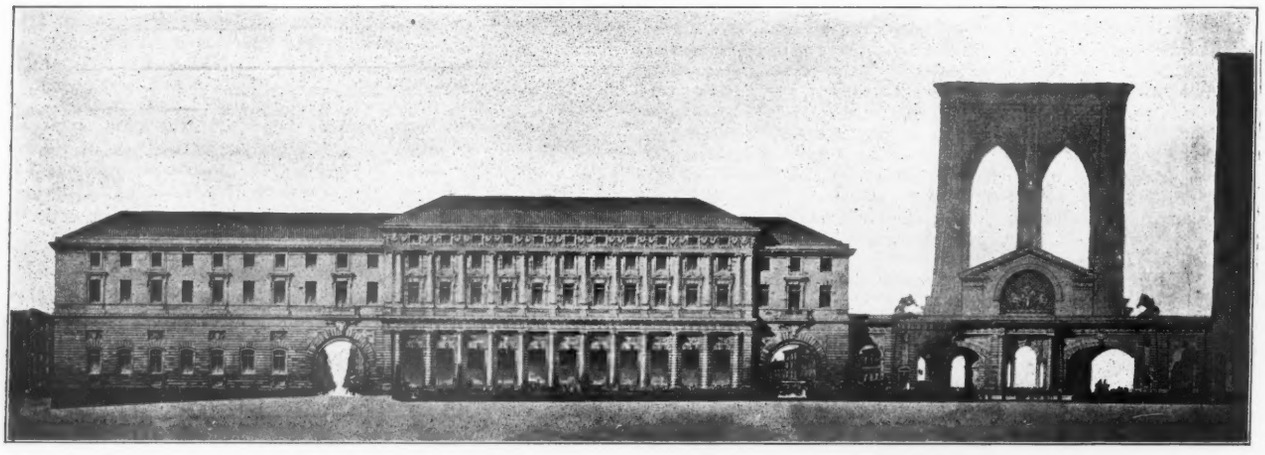
Second.—There would be serious delay in arriving at actual earnings and other statistical figures for our own use and for reports to Interstate and State Commissioners.

Third.—We feel assured that if interline accounting in England had reached the same state of efficiency it has in America, the clearing house would never have been started.

The New Manhattan Terminal for the Brooklyn Bridge.

On July 7, the Board of Estimate and Apportionment of the City of New York finally approved a plan for enlarging and rebuilding the New York terminal of the Brooklyn Bridge, and it is expected that work on the foundations of the buildings will be begun within a year. There have been innumerable plans proposed for improving the congested traffic conditions at the ends of the bridge, many of which were impracticable and well nigh impossible of application on account of their cost. The Bridge Department engineers have worked over the problem for the last six years and many other engineers have planned schemes which they have exploited in the technical papers and elsewhere but no two were agreed on even the same general plan. Former Bridge Commissioner Lindenthal drew up a plan two years ago which contemplated the erection of an enormous station and city office building on the ground bounded by Center, Reade, Duane and Pearl streets and Park Row. The plan as finally approved is substantially the same as the one proposed by him except that the building to be erected will be used exclusively for a bridge station.

The accompanying illustrations show the general appearance of the proposed new station and the arrangement of tracks. The present terminal will be entirely abandoned and a handsome and imposing building will be erected east of Center street. This building will have a basement below the street level into which the loop tracks for the trolley cars running over the bridge will be run. The ground level floor will provide for large waiting and assembly spaces with ample entrances from the street for the collection and distribution of passengers going and coming over the bridge. Park Row and Chambers street will be carried through the building under wide arches. A second or gallery floor at about the elevation of the mezzanine floor of the present station will provide for the distribution of passengers coming from the street and from the Manhattan Elevated trains to the elevated trains running over the bridge. The third floor will be the main station floor and will contain the tracks and platforms for the bridge elevated trains. This will have a great height in order to give adequate light and ventilation. Ample and commodious stairways will be provided from the ground floor to the basement and to the gallery floor and from the gallery floor to the main track floor. Independent stairways and elevators reaching the basement and upper floors will be built along the east side of the building.



Elevation of Proposed New Terminal for the Brooklyn Bridge.

The principal features to recommend this plan are that it provides:

(1) For an ornamental approach to the bridge in keeping with the other surrounding city buildings.

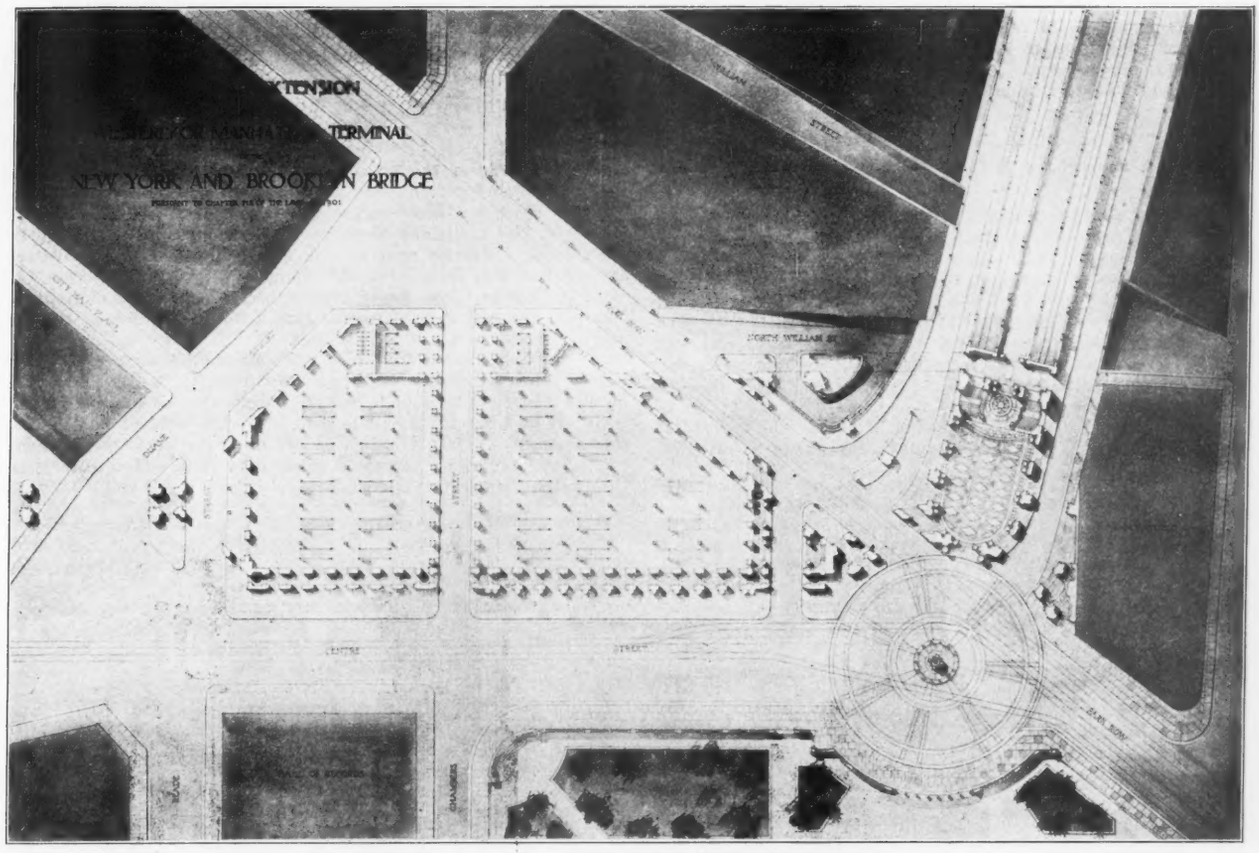
(2) For the free extension of Park Row and Chambers street under the building.

(3) For unobstructed access to the trolley loops and to the bridge elevated trains as well as to the Manhattan Elevated trains on Park Row.

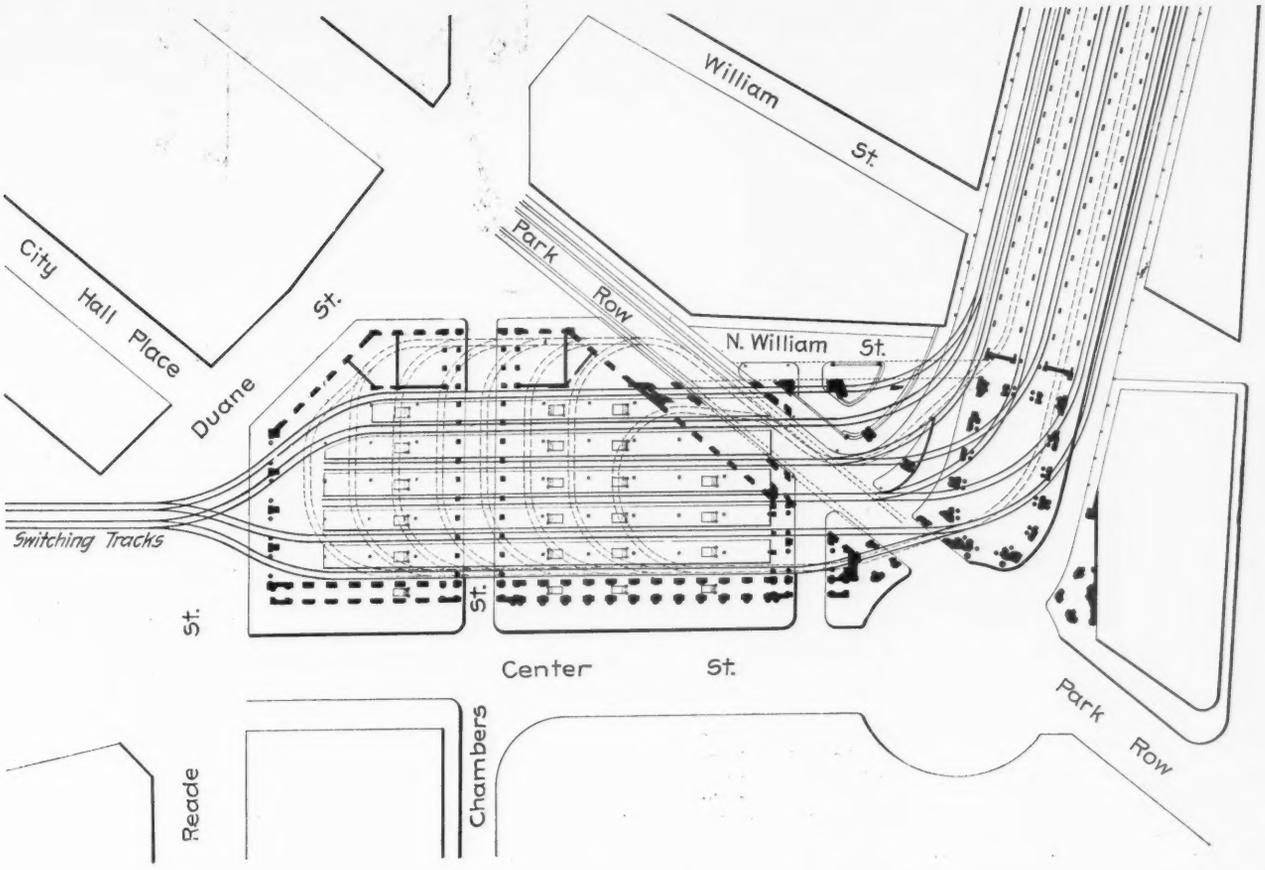
(4) For the assemblage of passengers taking bridge trains on separate platforms, avoiding the confusion, discomfort and danger of the present station where this separation is impracticable.

The new station will provide the same number of trolley car loops as in the present station and eight loading platforms for elevated trains, permitting the handling of about twice the number of passengers as is now possible. At present the number of trains which can be handled over the bridge is limited by the capacity of the station. With the new station the number of trains will be limited by the capacity of the bridge, which can be greatly increased over what it is at present.

The architectural features of the new terminal have been



Ground Plan of Proposed New Terminal.



Track Arrangement for Trolley and Elevated Cars in Proposed New Terminal.

worked out by Carrere & Hastings. It is estimated that the work will cost $3,000,000 exclusive of the cost of land, most of which has already been acquired by the city. Two years is the time estimated for completion after beginning the work, so that the new station should be in use by 1908.

We are indebted to Bridge Commissioner Best for the illustrations.

A Semaphore With a Vertical Motor.

The General Railway Signal Company, of Buffalo, is now using in its all-electric interlocking plants a semaphore signal worked by a motor of new design, and the mechanism is shown in the accompanying engravings. The motor, the axis of which is vertical, is in the bottom of the box, as shown in Fig. 3; and it lifts the vertical rod, which throws the signal to the all-clear position, by turning the screw which is seen in Fig. 4. The weight rests on ball-bearings. It will be seen that the apparatus as a whole has a very neat and compact appearance; and, as shown in Fig. 1, the case enclosing it is unusually narrow, so that the signal can be set between tracks where a wider box could not be used. The mechanism case opens both front and back, affording easy access to all parts.

Fig. 1.

Fig. 2.

General Railway Signal Company's Vertical-Motor Semaphore.

The simple and substantial lock for the case is shown in Fig. 2.

The mechanism is arranged symmetrically about a vertical center line and it is of simple and pleasing design, strong and well made. The motor case, at the extreme base, is waterproof and frost proof. The armature shaft is direct-connected to a vertical screw operating a ball-bearing nut which when rotated in one direction by the motor raises one of the vertical rods to clear the signal arms. When the signal arm is fully cleared the current is cut off from the motor and is applied to a magnetic brake which holds the arm clear. When the arm is to be restored to the stop position the current is cut off the brake and the downward thrust of the counterweighted vertical rod rotates the armature backward, by means of the ball-bearing nut, and generates current for giving the "indication."

The signal is locked in the stop position by a simple device, and in the case of two arm signals the arms are interlocked so that when one is cleared the other remains locked. There are no moving wires in the mechanism and all mechanical parts are galvanized to prevent rust, in addition to which a canopy is so placed as to prevent drippings from condensation falling on the mechanism.

By exchanging standard parts this signal can be converted from a single arm to double arm, or to a 60 deg., 75 deg. or 90 deg. throw; and can be made slotted or non-slotted as desired. It can also be operated as either a two-position or three-position signal.

Fig. 4 is a rear view of the mechanism for a two-arm signal. It provides for throwing the arms to the stop position by the usual electric-slot arrangement. Where the slot is not used the dash pots are omitted. For a one-arm signal the apparatus is, of course, simpler than that shown in Fig. 4.

Road Tests of the B. & O. Mallet Compound.

The Mallet articulated duplex compound locomotive, No. 2,400, which was built at the Schenectady works of the American Locomotive Company for the Baltimore & Ohio, is the largest locomotive yet built. It was completed about a year ago and was exhibited at the Louisiana Purchase Exposition at St. Louis during the summer. At the close of the Exposition, the locomotive was brought east and assigned to the Connellsville Division of the Baltimore & Ohio to assist heavy freight trains over the mountain. It was put into regular service on Jan. 6, 1905, and during the first five months made about 13,500 miles.

The object in building such a mammoth locomotive as this is was to balance the amount of power available on the division on the up and down grades and to reduce the number of locomotives and train crews required to handle the heavy slow freight tonnage over the mountains. The division on which it is working has heavy grades and therefore maximum adhesive weight was necessary, and this weight had to be distributed over a short rigid, and a long flexible wheel base, as the curvature is sharp, in one place being 9 deg. and at another point on a reverse curve on the heaviest grade 7 deg.

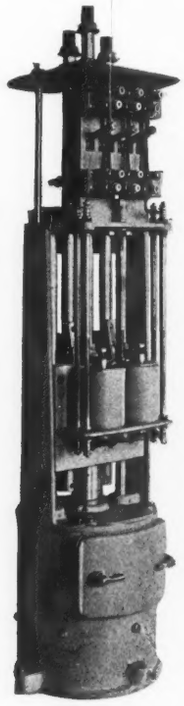


Fig. 3.

Fig. 4.

Mechanism for Two-Arm Signal.

A complete description of engine No. 2,400 was given in the *Railroad Gazette*, May 27, 1904, but it may be well to give here the principal weights and dimensions, which are as follows:

Weight in working order, on all drivers	334,500 lbs.
Weight, total, including tender loaded	479,500 "
Wheel base of engine	30 ft. 8 in.
Rigid wheel base	10 ft.
Diameter of drivers	57 in.
Cylinders, stroke	32 in.
Cylinders, diameter	20 in. and 32 in.
Heating surface, total	5,585.7 sq. ft.
Grate area	72.2 sq. ft.

The total weight is about 193,500 lbs. less than the combined total weights of two of the largest consolidation locomotives used on the same division. While the drawbar pull behind the tender of two of the largest consolidation engines is about 79,400 lbs., the drawbar pull of engine No. 2,400 is 74,000 lbs. when working compound and 84,000 lbs. when working simple. Two of the consolidation locomotives double-heading, can take a train of loaded steel hopper cars of 100,000 lbs. capacity weighing about 2,025 tons up the mountain. Engine No. 2,400 and one consolidation can haul 3,210 tons up the same grade. These comparative figures are based on engine performances at 10 miles an hour under fair weather

and rail conditions, good average coal, and with engine No. 2,400 working compound.

The performance of the Mallet compound during five months of hard service has demonstrated that the various special features which have been combined in its design will give satisfactory results from an operating standpoint. The articulated wheel and cylinder arrangement, as well as the duplex compound system with its intercepting valve and simpling gear device, Walschaert valve gear, combination hand and power reversing gear and flexible intermediate receiver and exhaust pipes, have all given complete satisfaction and caused no trouble. The engine takes curves well when moving ahead or backing up and there has been very little flange wear, although all driving wheels have flanged tires. The steaming capacity of the boiler, working of frictional parts, cylinder packing, piston and slide valves and other features of the design have given no trouble.

This engine has tubes 2¼ in. in diameter and 21 ft. long, but no difficulty has been experienced with choked flues or leaking tubes or fire-box sheets, nor has there been any trouble on account of priming or defective lubrication in the cylinders. Some changes in the minor details might be desirable if more engines of this type are built in the future, but as a whole the design has proved very satisfactory for the work which is being done. The cost of maintenance remains for future performance to determine, but from present indications, the cost per ton-mile hauled will not be greater than that for consolidation engines engaged in similar helper service.

When operating over the Connellsville Division, which has both level track and long heavy grades, the Mallet compound has used less coal per ton-mile than the simple consolidation engines now in service, and when operated on comparatively level divisions it consumes materially less coal per ton-mile. The following data are the average results obtained on several through runs during the month of January, 1905, over the division between Connellsville and Rockwood and Connellsville and Sand Patch, the runs being from 44 to 60 miles long:

Running time	5 hrs. 29 mins.
Time lost by stops	3 " 38 "
Total time of trip	9 " 7 "
Speed while running, miles per hour	9.7
Temperature of atmosphere	33 degs. F.
Temperature of feed water	33 degs. F.
Kind of fuel used	Bituminous, about 40 per cent. volatile, run-of-mine grade.
Pounds of coal used per trip	24,900 lbs.
" " consumed per sq. ft. grate area per hour	61.8"
" " per mile run	472 "
" " per thousand ton-miles	215 "
Number of loaded cars hauled	34
Number of empty cars hauled	0
Gross tonnage per train (in tons of 2,000 lbs.)	2,193
Maximum boiler pressure	230 lbs.
Minimum boiler pressure	202 "
Average boiler pressure	220 "
Pounds of water evaporated per pound of coal	6.4"
Pounds of water evaporated per lb. of coal, from and at 212 deg. F.	7.9"
Minimum gradient on line	Level.
Maximum gradient on line	1 per cent.
Average gradient on line	0.5 per cent.

On the 1 per cent. grade, which is 6½ miles long, engine No. 2,400 was assisted by one of the regular consolidation type locomotives. On all other portions of the line, where the gradients range from 1 per cent. for a distance of one mile, .75 per cent. for a distance of five miles, .68 per cent. for a distance of two miles, and other grades average from .3 per cent. to .5 per cent., the compound handled the train alone.

The performance of this locomotive for 24 consecutive trips—helping trains and operating over a total distance of 14.8 miles up the mountain, the first 8.3 miles of gradient ranging from .2 per cent. to .5 per cent., and the remaining 6.5 miles being 1 per cent. averaged as follows:

Running time	1 hr. 45 mins.
Time lost by stops	2 hrs. 16 "
Total time of trip	4 " 1 "
Speed while running, miles per hour	9.1
Temperature of atmosphere	17 deg. F.
Temperature of feed water	33 deg. F.
Kind of coal used	Bituminous, about 20 per cent. volatile, run-of-mine grade.
Pounds of coal consumed per trip	8,225 lbs.
Pounds of coal consumed per sq. ft. of grate area per hour	66 "
Pounds of coal consumed per mile run	584 "
Pounds of coal consumed per thousand ton-miles	308.5"
Number of loaded cars per train	39
Number of empty cars per train	None
Gross tonnage per train (in tons of 2,000 lbs.)	2,049
Maximum boiler pressure	230 lbs.
Minimum boiler pressure	188 "
Average boiler pressure	218 "
Pounds of water evaporated per pound of coal	5.4
Pounds of water evaporated from and at 212 deg. F., per lb. of coal	6.7
Total amount of water used while running	39,142 lbs.
Total amount of water used during stops	6,652 "
Total amount of water used during trip	45,794 "
Per cent. of total amount of water used while locomotive was standing	14.5%

One engineer and one fireman were used on all of these tests to operate the locomotive during each trip. During the tests there were no fire-box, boiler tube, or other water or steam leaks around the boiler or machinery of the locomotive, and the waste was that relieved through the pop valves, from injector overflow, on account of condensation, using heaters on injectors, and other similar causes due to winter weather and freezing conditions. There were no failures or delays on account of the locomotive, except for fire cleaning, which work was performed at the termination of the run.

In mountain-helper service, locomotives are frequently required to remain at work for long periods between fire cleanings, and during such intervals with the forcing of fires to the maximum, and pushing trains up the grade, together with drifting down grade, and long time between trips, there is considerable opportunity for variation in the temperature in the fire-box and flues, which would tend to cause leakage and failure. Under such conditions, however, engine No. 2,400 has been able to meet the requirements, and at the same time make use of an ordinary grade of run-of-mine bituminous coal, and maintain ample boiler pressure at all times.

Transportation of Explosives on the P. R. R.

The Superintendent of Freight Transportation of the Pennsylvania Railroad has issued a circular (No. 174 A) giving elaborate regulations for the transportation of explosives. This is a carefully prepared document, and only lack of space prevents reprinting it here in full. For transportation purposes explosives are divided into six groups: Common black powder; high explosives; smokeless powders; fulminates; ammunition; fire works. Detailed instructions are given concerning each class, and the nature of the article is briefly described. The road prefers that black powder be shipped in wooden boxes or casks, but naked iron casks or kegs will be received if well made; and a test is prescribed. Such a cask filled with sand of the same weight as the powder must withstand a drop of four feet on a rail and not be ruptured. With few exceptions explosives must be put in packages of not over 100 lbs. each. High explosives will not be received if they contain over 60 per cent. of nitroglycerin (except gelatine dynamite). Gun cotton and smokeless powder must, when shipped, have a certain percentage of water. The term fulminates does not include percussion caps, etc.; it means fulminate of mercury in bulk. Fulminate of mercury must have 25 per cent. of water and be put in a duck bag. This must be put in a rubber bag, which must then be filled with water and securely tied. The rubber bag and its contents must then be put into a tight cask, packed around with sawdust, and the cask filled with water and bunged and sealed up. Ammunition for Government use is not dealt with in this circular. Fire works must be packed in tight wooden boxes. Fulminate, ammunition and fireworks must not be loaded with each other nor with the other classes named.

Carloads of explosives will be received any day except Saturday, but less than carloads only on Mondays and Thursdays. Ammunition and fireworks are received at any time.

Shippers and agents have to sign certificates of inspection. Agents must send copies of this circular to all shippers of explosives. Sections 23 and 25 say:

23. Only *steel underframe box cars, equipped with air-brakes in condition for service*, and which have been specially selected and specially inspected, will be used in the transportation of the first four groups of explosives in lots of 5,000 pounds or over, and they must be in first-class condition in every respect, both inside and outside. The following points must be carefully looked after: The car must in no case have loose boards or cracks in the roof, sides or ends, and the doors must be shut so closely that no sparks can get in at the joints. When these explosives are loaded in carloads the doors must be stripped, except when the cars are equipped with Wagner doors, which must not be stripped. The journal boxes and trucks must be examined, and so cared for as to reduce to a minimum the probability of hot boxes or other failure, requiring the car to be set off before reaching destination. The car must be carefully swept out before it is loaded and a careful inspection made of the inside. Holes in the floor or lining must be repaired and special care taken to see that there are no projecting nails or bolts, or pieces of metal which may work loose and produce holes in packages of explosives during transit. Short pieces of hard wood, two-inch plank, must be spiked to the floor over the king bolts or draft bolts to prevent possibility of their wearing through the floor and into the packages of explosives. Agent or inspector must examine cars and sign C. T. 477 before permitting the cars to be loaded or despatched.

25. In handling packages of explosives at stations and in cars, the greatest care must be taken to prevent their falling or getting shocks in any way, and they must not be thrown or dropped, but must as far as practicable be passed from hand to hand, or carried by one or more persons, and must not be rolled on the platform or car floor, unless they are so heavy that this cannot be avoided. The agent must choose careful men to handle explosives, must see that the platform and feet of the men are as free as possible from grit, and must take all possible precautions against fire. No unauthorized person must have access to the explosives at any time while they

are on the property of the company. Should any packages of high explosives when offered for shipment show outward signs of any oily stain or other indication that absorption of the liquid part of the explosive in the absorbent material is not perfect, or that the amount of the liquid part is greater than the absorbent can carry, *the packages must be refused in every instance, and must not be allowed to remain on the property of the company.*

A rubber stamp is prescribed for stamping a certificate on the way bill and on the car card. Section 30 says, in part:

30. (a) Not more than one car carded with C. T. 81 will be handled in a train for through road movement (except by permission of the Superintendent Freight Transportation). Such train must not consist of more than thirty (30) cars, two-thirds (⅔) of which must be air-brake cars in service. A car carded with C. T. 81 must be placed as near center of train as possible, but never closer than ten (10) cars from the engine. It must be placed between two box cars in good condition not loaded with oil or other inflammable material, lumber, or other articles liable to break through end of car from rough handling.

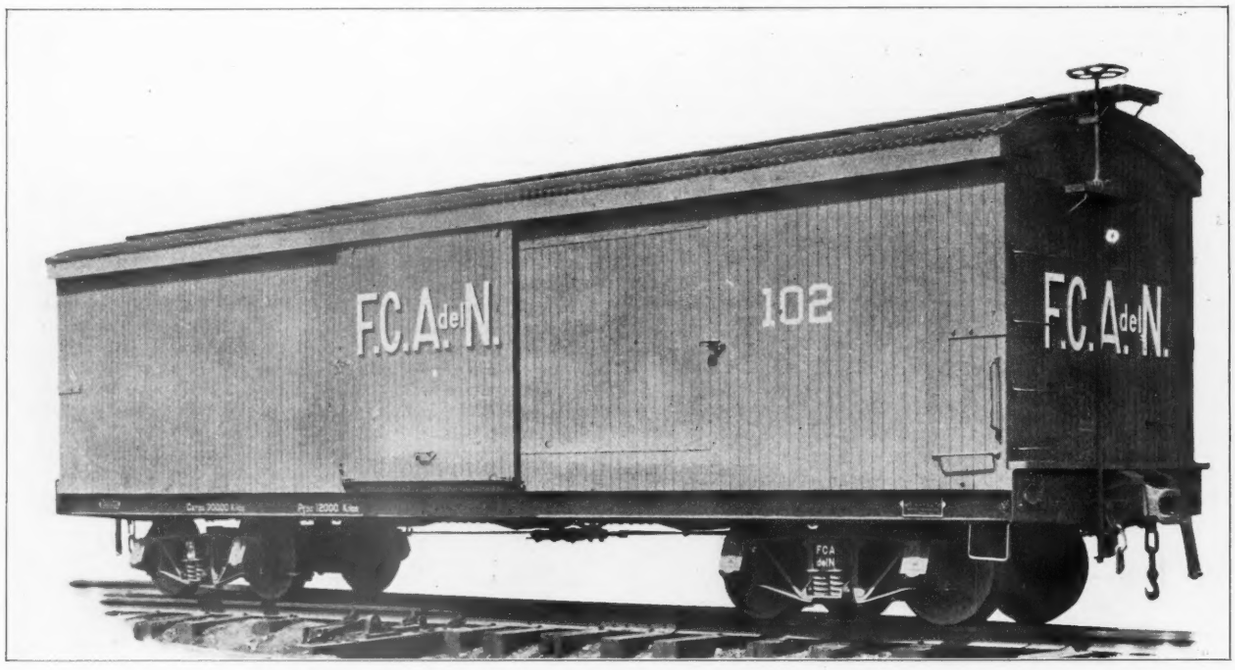
(b) Cars carded with C. T. 81 handled in shifting or distributing trains may be handled more than one car per train, provided train does not consist of more than thirty (30) cars and that all air-brakes in condition for service are used. Cars should be handled as near center of train as possible.

(c) In handling cars carded with C. T. 81 in yards or placing on sidings to unload, they must be coupled to engine protected by a car between. When this is not possible in placing cars on a siding, a rope or pole may be used, *but a flying switch must not be made under any circumstances.* Other cars must not be allowed to strike a car carded with C. T. 81. They should be so placed in yards or on sidings that they will be subject to as little handling as possible and removed from all danger from fire.

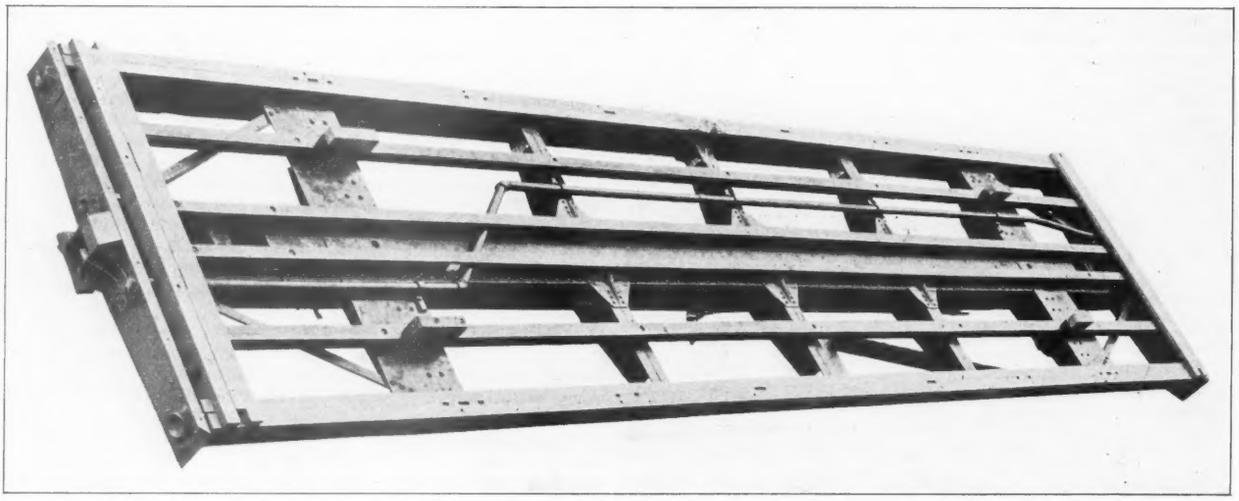
Finally, instructions are given for dealing with cars of explosives in case of a wreck. Damp earth mixed with explosives helps to render them safe from fire, sparks or blows. Where fulminate has been scattered on the ground it is necessary to saturate the ground with oil.

Box Cars for the Argentine State Railways.

The recent large order for cars given to the Middletown Car Works, Middletown, Pa., included besides 100 gondolas and 150 flat cars, 250 box cars of 66,000 lbs. capacity. The flat cars and gondolas have been illustrated and described in the *Railroad Gazette*, March 3 and May 5, 1905, and as the details of the underframing of the box cars are essentially the same as for those already illustrated, drawings have been omitted here. These box cars are 32 ft. 10⅜ in. long, 7 ft. 2⅜ in. wide, and 7 ft. 3 in. high, inside. They have steel channel underframes, made up of two 10-in., 15-lb. channel center sills placed back to back 14 in. apart and boxed in with top and bottom cover plates for 19 ft. 11 in. of their length between bolsters, two 12-in., 20.5-lb. channel side sills and bent plate end

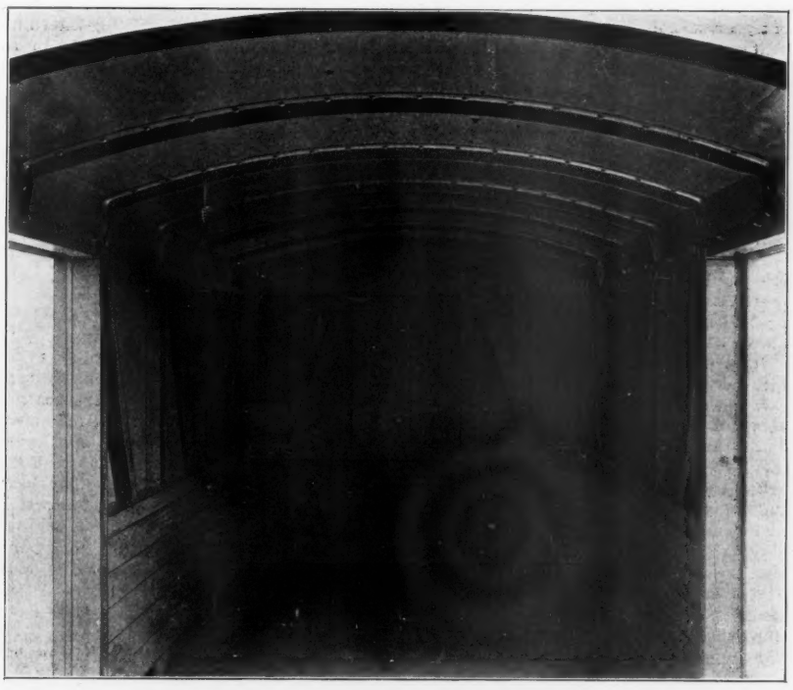


Steel Underframe Box Car for the Argentine State Railways.



Underframe of 33-ton Box Cars for the Argentine State Railways.

sills with diaphragm bolsters and cross-bearers. The upper framing is of wood except the roof carlins, which are 2-in. x 2-in. x ¼in. angles bent to the proper curvature of 10 ft. radius. The posts and braces are framed into the plate and side sills with malleable iron pockets. Inside sheathing is carried up to the belt rail 32¾ in. above the floor. The cars have sliding doors in each side 6 ft. wide and 6 ft. high. They are mounted on diamond arch bar trucks built for meter gage, and are equipped with continuous draft gear, link and pin couplers, and are piped for vacuum brakes, although not equipped with diaphragms. The roof is made of ¾-in. boards covered with corrugated iron.



Interior of Box Car Showing Steel Carlins.

We are indebted to Mr. George I. King, Vice-President of the Middletown Car Works, for the illustrations.

The Testing Engineer.*

The gradual widening of the scope of the word "engineer" is very interesting. Used apparently as long ago as the time of William the Conqueror, to designate men who had the ability to design and construct works of value, such as castles, or fortifications, or bridges, especially in connection with military affairs, it soon took on a wider meaning, and was properly applied to men having ability to design and construct works of practical utility in times of peace. The military men having simply been called "engineers," it became desirable to distinguish those who were doing similar work during peace times, and they were called "civil engineers." Primarily applied apparently to one who had genius born in him, and therefore who had within himself the power to originate and to execute in course of time, we find the term applied to those also who simply direct, or carry to successful conclusion something they may have taken in hand. Indeed at the present time the one who controls the machinery of a ship, as well as the one who handles the throttle of a locomotive, is called an "engineer." And finally it is apparently no abuse of words to say of a man who has guided any scheme in which he was interested, with ingenuity and tact, or overcome obstacles by contrivances and effort, that he has successfully engineered his project through. In view of these thoughts, we are perhaps justified in regarding the man engaged in testing as an engineer.

It is plain that the testing engineer acts in a three-fold capacity. He is either an investigator, or a counsellor, or a judge. He is finding out new truths, he is protecting the interests of his client the producer, or he is determining by his tests that contracts are being fulfilled, or specifications lived up to, in the interests of his client the consumer. There are three kinds of testing engineers, the unattached engineer, the consumer's engineer and the producer's engineer. It did not take long after consumers began to test materials and prepare specifications before producers found it necessary to protect their interests and defend their materials by means of testing engineers in their own employ.

What shall be the cast of mind, and what the mental equipment of the testing engineer? We will perhaps all agree that he should be independent, self reliant, gifted with the power of analysis of facts, as well as with the power of drawing conclusions from the data at hand. He should be ingenious in devising methods to demonstrate the points at issue, and a careful observer of data. He must keep himself free from bias or prejudice, and take especial pains that he does not deceive himself. He should be fond of experiment and have a genius for it. Above all he should be a thinker. No man who, when a problem is presented to him, simply searches his memory for whatever he may have learned in the schools, or picked up in his reading, which bears on his problem, has any especial call to be a testing engineer. The power of seeing analogies between your own problem, and one that some one else has had, is legitimate and useful, but the one who habitually and continuously approaches every problem through memory, or by studying up what others have done, is far less likely to succeed as a testing engineer than one who habitually attacks a problem by an analysis of its elements.

But if experimenters are born, not made, what can the schools do in the way of training? Given fair mental endowment, it is possible for the schools to make successful testing engineers, or to spoil the material they start with.

But the mental equipment which the schools furnish is only a fraction of that needed by the testing engineer, especially if it be his duty to defend the interests of a great consumer. The schools should teach a young man how to learn, and should start him in a number of subjects, but his real education comes later. The man who expects to reach even moderate success as a testing engineer, must study harder the first five or ten years after graduation than he did at any time while in school. He must accumulate experience by arranging the information already acquired by reading, by study, and actual contact with industrial processes, and with the world's work, in every possible detail, and above all, a man must acquire experience by actual wrestling with problems that may be committed to his care. It is apparently not essential, in order to gain experience, that one should successfully solve his problems. Faraday was accustomed to say that he actually learned more by his failures than from his successes. The testing engineer should be an omnivorous student. Nothing is too trivial to interest him, nothing too remote from his present line of work to make a legitimate demand on his attention should opportunity offer. You can never tell what moment you will need and badly need some out of the way fact.

In a broken steel car axle recently seen, the break occurred 10 or 12 in. from the end of the axle. On examining both sides, there was some appearance of seams, not radial, but irregularly parallel to the circumference. These seams suggested that probably the axle was made from a billet coming from somewhere near the top of the ingot, and that the seams were in some way connected with the pipe. It was reasoned that if this were true, an analysis of the metal from the surface and from the center of the cross section of the axle, would show segregation, and that if, for example, much higher phosphorus were found in the center than at the circumference, it would almost be a demonstration of the location of the billet. Of course the whole object of the study was to see if any information could be obtained that would prevent the acceptance of such bad axles in the future. It should be mentioned that the broken off piece was sawed in two lengthwise, and that when this was done, from one of the halves a core amounting to about a third of the cross sectional area actually fell out, showing that the seam indications at the end were genuine, and that the seam did actually exist. The analysis above referred to was made, and to our astonishment showed lower phosphorus in the center than in the circumference. This seemed to settle the question as to the relation between the seam and the pipe, and indeed we regarded it as conclusive evidence that the billet from which this axle was made was not taken from too high up in the ingot, but it left unsettled the cause of the seam. Perhaps, however, a few words farther on certain well-known phenomena in steel metallurgy will help us in clearing up the point. It is obvious that if in a big ingot, a portion of it contains more than the normal amount of phosphorus, carbon or sulphur, as is actually the fact in the case of segregation, it must follow that there will be parts of the ingot which will contain less than the normal amounts of these constituents. It is generally assumed that the outside of a forging like an axle gives very close to the normal analysis of the steel, since from the method of manu-

*Extracts from the annual address by President Chas. B. Dudley, of the American Society for Testing Materials, delivered at the Atlantic City meeting June 29.

facture this outer metal was near the surface of the ingot when the metal was cast, and consequently cooled too quickly to permit perceptible segregation. Also if we are right the analysis of borings taken from different parts of the inner face of an ingot sawed in two lengthwise for the purpose, shows that phosphorus, carbon and sulphur, near the middle of the lower third of the ingot, are usually below the normal. Now since the phosphorus in the center of our axle was lower than in the circumference, it seems evident that the billet from which it was made must have been from somewhere in the lower third of the ingot. . . . Seamy bottoms of ingots are now usually explained by wet or insufficiently dried bottoms of ingot moulds. The steam or other volatile material generated by the heat of the molten metal can apparently only escape up through the molten metal itself, forcing a seam, which the subsequent treatment does not weld up.

Another brief illustration will perhaps emphasize the importance to the testing engineer of familiarity with the minute details of industrial processes. A couple of years ago, while the finishing cut was being taken on a steel driving axle in a lathe, the operator noticed in the freshly cut surface what appeared to be a small flaw. On testing this with a pin, the pin disappeared, and quite a length of fine wire followed it. On taking out a transverse slice of the axle at this point a cavity was found in the metal, which would hold half a pint or more. The walls of the cavity were perfectly clean and bright, and but for the fact that the finishing cut just happened to open up the cavity a trifle, its presence would not have been suspected, and the axle would have gone into service. It is perhaps safe to say that one-quarter or possibly one-third of the cross sectional area of the axle was embraced in the cavity. We have seen a number of such cases, and unfortunately the phenomenon is not rare. Almost any practical steel maker when asked for the cause of such a cavity in what is apparently a solid piece of metal, would probably laconically answer, "careless heater." In order to understand this statement, it is necessary to say that many driving axles, even when they are finished, are about 11 in. in diameter, and that the bloom from which they are forged is considerably larger. If now such a bloom when cold is put into a hot furnace, the outside layers get hot long before the inside has begun to rise much in temperature. A severe strain due to the greater expansion of the outside layers is accordingly set up, which strain is enongh occasionally to actually rupture the inside. Subsequent forging opens out this rupture into a cavity. The rupture is usually accompanied by a noise like a pistol shot. The unfortunate part of the business is that there being a number of blooms in the furnace at one time, it is impossible to tell which one has yielded to the strain. As would be expected, the larger the axle the more common this defect, and we know of one large railroad that bores a 2 in. hole through every axle over 8 in. in diameter that is destined for passenger service. The boring of the hole enables the cavity to be discovered, either by the behavior of the drill, or by sight examinations after the hole is finished. It is interesting to know that something over 2 per cent. of all axles bored are found defective in this way.

It may seem an idle question, but it is certainly an interesting one, as to which of the three kinds of testing engineers has the most attractive field of work. The unattached testing engineer certainly has the greatest freedom, but at the same time, the least stimulus. The producer's testing engineer undoubtedly has the best financial reward, but at the same time the narrower field. He has, however, the advantage of concentration, and as almost every modern industry has scores of unsolved problems connected with it, there is no reason, if he will work, why he should not achieve a great success. On the other hand, the consumer's testing engineer has unquestionably the broader field, the greater chance for initiative, and perhaps more important than all, an opportunity to study the behavior of materials in actual service. This last gives him a great advantage. Behavior in service is unquestionably the ultimate criterion by which every industrial product must be judged, and by which decision, sooner or later, it must stand or fall. Undoubtedly individual characteristics are a legitimate element in the choice, but our counsel would be to every ambitious testing engineer to get as near to the service as possible, and to this end to take some sacrifice if necessary to secure a position with a consumer.

There is one more phase of the work of the testing engineer which will perhaps bear a few words, and that is the relation between the testing engineer and those whose material he is testing. This is unquestionably a delicate subject, one that we would all gladly feel did not need discussion or comment, and yet one that is constantly thrusting itself into prominence in some form. For the honor of human nature, it is gratifying to be able to put on record that during nearly 30 years of almost constant testing, only once have direct financial considerations been urged upon us to influence our verdict in regard to material. On the other hand, we have heard representatives of entirely reputable business organizations say openly, "It costs us something to sell our goods, and it is entirely immaterial to us whether this money goes to our selling agents, or to the representatives of the consumer." And this is not the worst phase of the matter. It is well known that the representatives of consumers who act in some sense in the capacity of testing engineers, in that their opinion or decision determines the giving of orders, not only accept substantial considerations from producers, but even demand them, if not openly, at least indirectly. An hour could readily be filled in narrating incidents of showing the forms in which the hydra-headed monster graft manifests itself. Neither side is free from blame. Strict open honesty is the only safe course. It may not be amiss to add that so insidious are the forms in which this evil manifests itself, that in the words of scripture they would at times deceive the very elect, and while it is not possible to discuss these matters, without raising interminable questions of casuistry and metaphysics, it is possible to so act as to have the continuous approval of a clean conscience. No universal rule can be given. Each one in a sense must be a law unto himself. Perhaps the best every day working rule for young testing engineers is, do nothing you would not be willing to talk over with your employer, even in the presence of the other party. It is sometimes a bit hard to resist and say "no," but of one thing be sure, every departure from strict integrity will sooner or later return to plague you, and should your actions ultimately result in your downfall, from none will you get less sympathy than from those who may have contributed to your disaster.

Holmen Coaling Stations on the Pennsylvania Lines West of Pittsburg.

Since the first of last year the Pennsylvania Lines West of Pittsburg have installed a number of patented locomotive coaling stations at different points, built from a design by Mr. A. R. Holmen, Chief Draftsman of the motive power department of the Southwest System. The simplicity of their design and operation has resulted in a considerable decrease in the cost of handling coal. The location of these stations and principal characteristics are as follows:

Location.	Storage capacity, tons.	Operating power.	No. of coaling tracks.	Capacity of buckets, tons.	Hourly cap. for handling coal, tons.
Lancaster, Ohio	150	Electric motor	1	2	75
Richmond, Ind.	350	" "	2	3	100
Logansport, Ind.	350	" "	3	3	100
Bradford, Ohio.	350	" "	2	3	100
Mansfield, Ohio	350	Lidgerwood hoist.	2	3	100
Toledo, Ohio	350	Lidgerwood hoist.	2	3	100

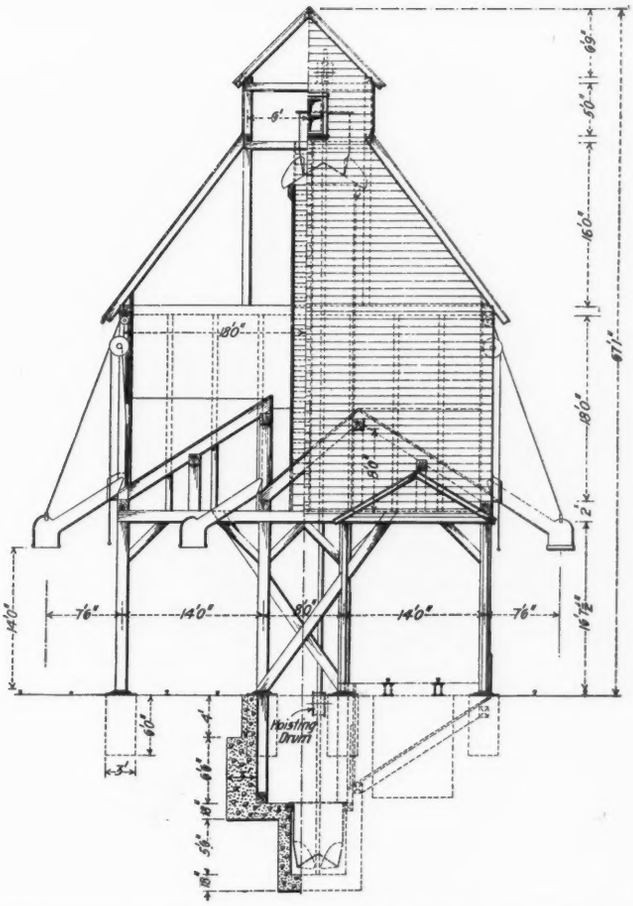
The drawings illustrate the Logansport station, with three coaling tracks and an unloading track, making a symmetrical structure with two tracks on a side. The coal is dumped from the car into a concrete pit having an inclined bottom formed of ⅛-in. steel plate. At the lower side of the pit are two sliding gates, each of which will admit coal into a bucket of three tons capacity. These buckets are raised alternately, the arrangement being such that one ascends as the other descends. At the top they dump automatically into the storage bin. The coal is delivered to the locomotives through gates and chutes which involve no novel construction. On some of the plants an undercut gate had been used both in the receiving pit and in the storage bin, but the simple sliding steel-plate gate shown in the drawings has been found entirely satisfactory and is therefore the preferred type.

The bucket pit is concrete. The buckets themselves are shown in detail. They are rectangular in section and made of $^{5}/_{16}$-in. steel. In the lower part of each side is an opening 30 in. high and the width of the bucket, which is closed by an apron hinged at the bottom. The bottom of the bucket slopes both ways from the middle. Each apron is closed by two latches on the outside of the bucket. The top of the bucket is higher on the side toward the unloading pit. Its contents would naturally be higher on that side because of the direction of flow of the coal into the bucket. The buckets are hoisted by wire cables running over sheaves at the top of the station, to a drum on the ground between the two bucket pits driven by an electric motor or a steam engine; the cables being so attached to the drum as to give the alternate motion already referred to.

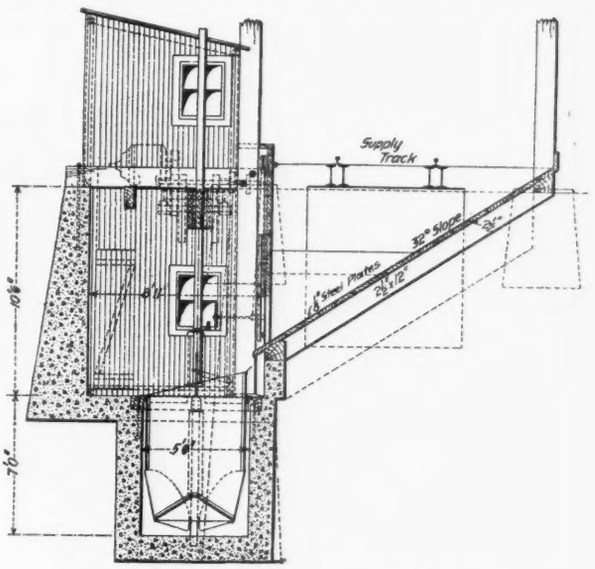
The guides for the buckets are 4-in. x 6-in. timbers faced with 4-in., 5¼-lb. channels. As the bucket reaches the top the apron latches encounter dumping springs secured to the guides, which release the aprons. The form of the sides of the bucket shaft at the top is such as to permit the aprons to open gradually. They are closed as the bucket descends by the curved springs seen on each side of the shaft, just below the top.

The four stations on the Southwest System are electrically driven, power being furnished by a d.c., series, 120 or 240-volt, reversible motor, geared directly to the hoisting drum. It is operated by a standard street car controller. A safety feature is provided in the form of a simple magnetic brake on the armature shaft. This brake holds the load the instant the current is intentionally or accidentally cut off from the motor. In addition to the regular overload circuit-breaker, a magnetic limit switch is arranged to trip the breaker if for any reason the bucket should overrun its regular travel.

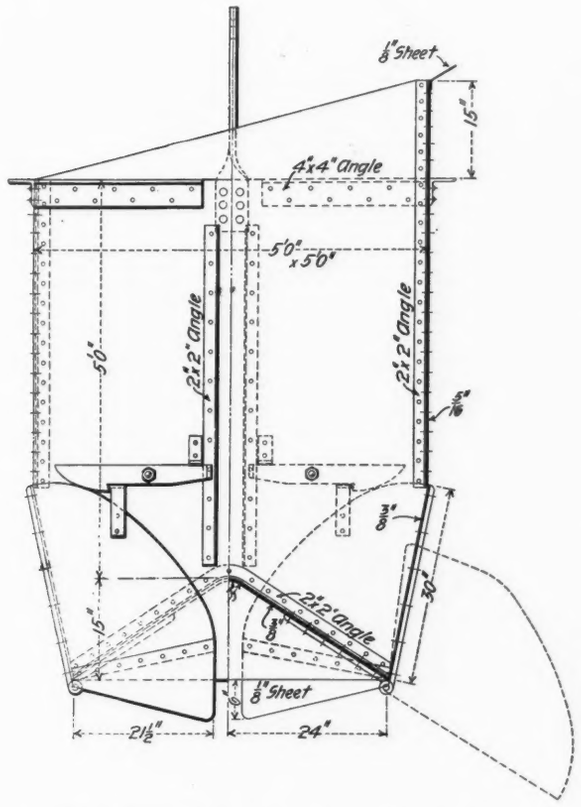
The average time required for filling and elevating a bucket is



Cross-Section through Holmen Coaling Station for Pennsylvania Lines at Logansport, Ind.



Section through Unloading Chute and Pit.



Detail of Hoisting Bucket for Holmen Coaling Station.

one minute, the operation being under the control of one man. Where 70 to 80 per cent. of the coal is received in self-clearing cars, the station can be operated by three men. The hourly capacity averages 100 tons, and the number of hours a day necessary to run the plant therefore depends on the amount of coal used.

In his paper on "Progress in Yard Design" in the *Railroad Gazette* of May 12th, Mr. W. C. Cushing, Chief Engineer M. of W. of the Southwest System, gave some figures comparing the costs of handling coal per ton for various types of coaling stations, based on a daily capacity of 700 tons. The figures included interest, depreciation and repairs. Of the several types, the Holmen station showed the lowest cost per ton. Mr. Cushing adds that it "has been found to be an admirable compromise for the large majority of small and medium stations between the expensive trestle on the one hand and the expensive belt conveyor on the other, which is the only type practicable for large coaling stations." Other Holmen stations are planned for the Pennsylvania Lines West.

Locomotives at the Liege Exhibition.

BY C. B. KING.

A general survey of the locomotives at the Liege Exhibition shows that the chief feature of difference in details between the 1900 exhibition of Paris and this one is the introduction of the piston valve and the widespread use of superheated steam among Belgian locomotives. Notwithstanding the strong objections which have persisted in Europe against piston-valves, their use is extending rapidly for four-cylinder compounds in France, Belgium, Italy, Hungary, many states of the German empire, and Russia. In Belgium, the reason given for their adoption is the wide introduction now made of superheated steam, although elsewhere there are numbers of engines fitted with slide-valves and using superheated steam, yet in all the French locomotives shown, piston valves are used with saturated steam.

The present exhibition shows a complete transformation in Belgian locomotive design. Excepting for the Nord Belge Railway, where the de Glehn type of locomotive of the French Nord has been employed for some years, the prevailing type of locomotive has been of Scotch design, in particular that of the Caledonian Railway. This Stephenson type, pure and simple, had supplanted the remarkable Belgian 2-4-2 engines originated in 1889, and now, in its turn, it is destined to disappear.

The leading features of the new locomotives, with an external appearance clearly attributable to the Scotch type, may be summarized as follows: Boiler of unusually large capacity; four cylinders compounded; cylinders located in one transverse line beneath the front end; piston valves, one for each cylinder; adoption of the Walschaerts valve gear, which has been very little used even with freight engines; working of the four valves by two sets of valve gears, and the use of a rocker shaft for the inside valves, both for compound and non-compound engines; all four main rods driving upon one set of wheels where the wheels are of large diameter, but in case of smaller driving wheels the first and second axles are driven from the different groups of cylinders. All these new types of 1905 have six connected wheels (4-6-0 type) and, as

before said, they have superheaters formed of three or else two small tubes doubled and lodged in the upper rows of flues which are of especially large diameter. In general, the new Schmidt superheater is employed, although the Cockerill superheater has much the same arrangement for the position of the reheating tubes.

In not only these newest designs is the superheating system introduced, but it is fitted also to numbers of ordinary Scotch type single expansion locomotives, also on exhibition, intended for all varieties of haulage services.

Apart from mechanism, the Belgian boiler construction is almost always the "Stephenson" with round topped firebox shell in place of the true Belpaire wide locomotive firebox formerly so much employed in Belgium for slack fuel. In most cases the old English smokebox is used, or its external appearance maintained, but in the case of the fine machines built for the State Railways of Belgium by Cockerill of Seraing, the American or circular flue plate is employed both for the most advanced type of locomotive design, as also for a very large "Atlantic" type engine having the cylinders disposed on the Webb plan, or, as more popularly known, as the de Glehn "system": the latter having the modified form of "Belpaire" firebox so much employed in France. It is remarkable how much Belpaire and Walschaert's ideas have been neglected in the country of their origin.

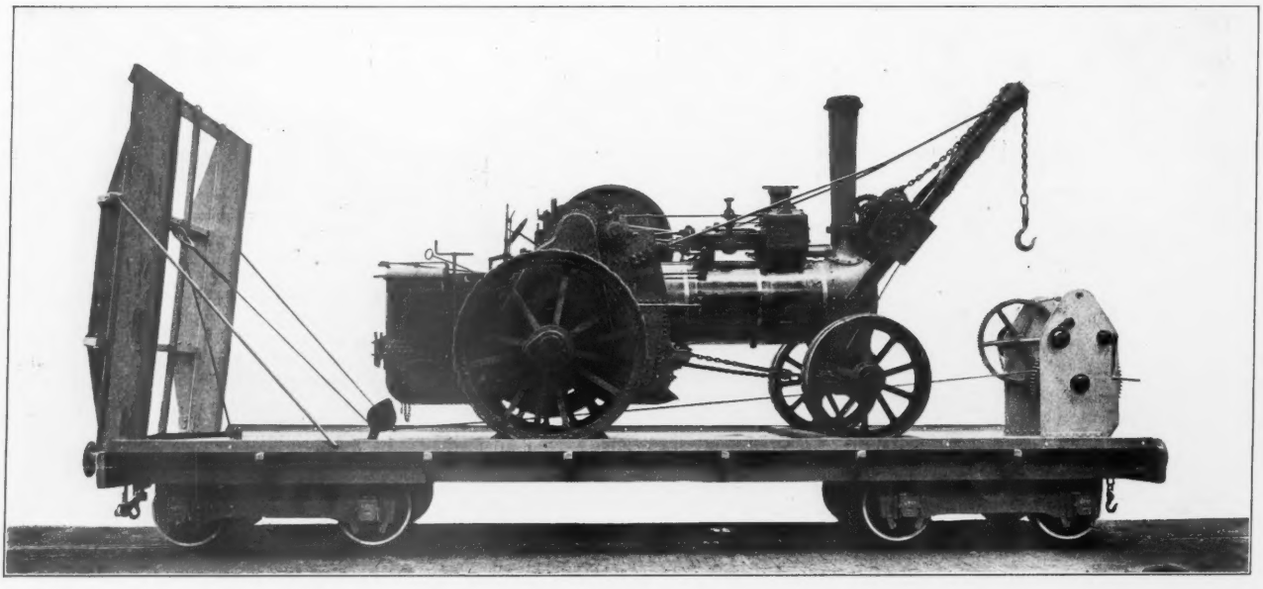
By a singular coincidence the two latest types of locomotives of the French "Nord" and Paris, Lyons & Mediterranean Railways stand alongside at the head of trains of specimen corridor cars belonging to those lines.

Both are four-cylinder compounds, the "Nord" engine originating from the de Glehn unconnected (therefore unbalanced) experimental locomotive introduced in 1885, but more directly from the modified (and connected or balanced) compounds which commenced service in 1902, or three years later than the Henry compound of the Paris, Lyons & Mediterranean line, which was designed in 1888 and put in regular service in 1889. These engines, to the number of six, were the first "balanced" four-cylinder compounds in Europe, for neither the Webb three-cylinder compounds which preceded the de Glehn experimental engine, nor this latter either, had their separate groups of engines connected together by side rods. Moreover, the Paris, Lyons & Mediterranean compounds were built, from the first, with the present approved location for the cylinders, that is, all in the same transverse line, although the rods drove, as they do at present, upon separate pairs of connected wheels. This arrangement of cylinders all in one cross line, is also to be noted in a de Glehn freight engine shown by the "Midi" or Southern Railways of France; but this disposition was only adopted for freight engines many years after the Paris, Lyons & Mediterranean.

Mr. Anatole Mallet, the originator of the first practical compound locomotive, who supervised the construction of the first tandem compound express locomotives built for Russia, is not represented at this exhibition by any locomotives of his own system; but a 16-wheel freight locomotive exhibited by the French Nord Railway is sometimes taken to be a modification of the Mallet system. This remarkable engine, which has been much noticed, differs from the Mallet in having two eight-wheeled motor trucks (of which twelve wheels are connected for adhesion) each truck having a separate pivot, whereas the Mallet engine has only one swiveling motor truck. Consequently the new freight locomotive has its trucks independent, as in the Fairlie engine, but it has only one firebox in its boiler, thus differing from the Fairlie. The design approaches more nearly to the Meyer system than any other, with these two principal exceptions, that the hinge connecting the two trucks together, as in the Meyer system, is not employed, and that instead of lateral main frames for the support of the truck pivots a central frame of box type extends from end to end of the engine and carries the draft gear, instead of the swiveling trucks carrying this as customary. Nevertheless, central buffing attachments are not provided, but instead, very broad side bumpers, suited for the ordinary freight truck of the Nord.

Special Flat Cars for Egypt.

The Leeds Forge Company, Leeds, England, has recently built for a plantation railroad in Egypt eight special flat cars for transporting agricultural implements. They have been designed especially for carrying traction engines which are used for steam ploughing, and the illustration shows a Fowler engine on the car ready to be moved. The cars are built entirely of steel and have a capacity of 25 tons. At one end a light steel runway is hinged to the endsill and at the other end a hand winch is permanently mounted. This is used for hauling the engines on to the car and for lowering them to the ground. When running, the runway is lifted to a vertical position and secured there by stays, as shown in the illustration. The buffers on the runway end are hinged at the bottom and



Special Flat Car for Transporting Agricultural Machinery in Egypt.

are held up against the endsill by a cotter pin which when removed allows them to drop down out of the way of the runway. Struts are also placed under this end of the car to carry part of the weight when the load is being hauled up. For loading light machinery such as ploughs and cultivators it is not necessary to use these struts, which are hooked up under the car when running.

The winch is used for raising and lowering the runway as well as for hauling up the load. The cable from the winding drum is passed through a snatch block attached to the floor of the car and is fastened to the outer end of the runway. Only a slight lift by hand is necessary to start the runway from a horizontal position and the remainder of the lift is done with the winch. To haul up a traction engine a snatch block is attached to the front of the engine and the cable is passed through it and fastened at the bottom of the winch. A pull of three tons can be obtained with the winch when working with double purchase so that with the snatch block arrangement a total pull of six tons can be had which is sufficient to load an engine such as is shown, weighing 22 tons. It is possible with this arrangement to lower the runway, load an engine and raise the runway ready for running in less than 30 minutes.

The Austrian-Hungarian State Railroad Company, which gets its name from the fact that it bought a state railroad long ago when the country needed money very badly and had no credit to speak of, has invested something more than $10,000,000 in manufacturing works in Austria and Hungary, including locomotive works in Vienna. Its income from these investments in 1904 was $144,000—less than 1½ per cent. on the investment.

GENERAL NEWS SECTION

NOTES.

The Pennsylvania Railroad is establishing the block system on the Philadelphia & Erie division.

The Boston & Maine is to use the electric train staff on a short piece of temporary single track at Haverhill, Mass.

On Tuesday, July 4, the number of fares collected on the cars of the Brooklyn Rapid Transit Company, Brooklyn, N. Y., operating the elevated and street surface railroads in that city, was 1,600,000.

The United States Bureau of Forestry is now officially known as the Forest Service. The control and administration of the national forest reserves, formerly under the Land Office of the Department of the Interior, is now in the hands of the Forest Service.

It is said that the New York, New Haven & Hartford has revised its notice refusing to continue through rates on all-rail coal to New England, and has limited it to shipments going to points west of the Connecticut river and south of the Highland division.

The Wabash Railroad has dismissed the superintendent and 132 men of the Secret Service department of the road. Interviews with officers of the road seem to indicate that the detective service is not to be entirely abandoned but that each superintendent is to take charge of the department on his own division.

On the Boston Elevated Railroad, the cars of which have one large door in each side at the middle, the side doors are now regularly used at all times, compressed-air opening-and-closing devices having been applied. With this apparatus all of the doors are opened and closed by the guard at the end of the car.

A Philadelphia paper announces that the Pennsylvania Railroad is to begin at once, and continue as fast as possible, the application of air-brake apparatus to the 10,000 or 15,000 freight cars belonging to the company which are not yet equipped. The same paper says that the Philadelphia & Reading has had all of its cars air-braked for two years.

Mr. G. S. Hobbs, of the Maine Central, speaking at the recent convention of accounting officers, in New York City, said that the uncoupling of cars in trains for the purpose of weighing them was unnecessary. He made experiments with 40 cars and found that the weights of the cars when coupled to others did not differ materially from their weights when detached.

The Grand Trunk and the Erie are determined that their passenger rates between Chicago and New York shall be two dollars lower than those of the Michigan Central, and the action of the M. C. in reducing its eastbound fare two dollars (to $18), in accordance with the decision of the recent Aribitration Board, has been followed by reduction to $16 (first-class) by the G. T. and the Erie.

Officers of the Interborough Rapid Transit Company, New York City, report that for the six months ending June 30 the traffic on the elevated lines was fully equal to that in the corresponding period of last year. This indicates that whatever traffic the subway lines have taken from the elevated has been fully made up by the increase in traffic which is caused by the increase in population of the city.

The Interstate Commerce Commission has revised its decision by which was established the differential on ex-lake grain from Lake Erie to Baltimore and Philadelphia. The differential prescribed—3 mills a bushel below the rate to New York—was intended to be equal to 5 mills per 100 lbs.; but the lighter weight of oats and barley was not thought of, and now the differential on these lighter grains is made 1⅔ mills.

The Legislature of Ohio has passed a law requiring that all mail cranes shall clear the widest locomotives 18 inches, and, according to an Ohio paper, every crane in that state on the Baltimore & Ohio and the Pittsburg, Cincinnati, Chicago & St. Louis will have to be moved away to a point farther from the track. To secure the uniformity which is necessary for convenience, it is said that the P., C., C. & St. L. will have to move the cranes throughout its lines, both in Ohio and in other states.

The *Poughkeepsie Press*, of Poughkeepsie, N. Y., says that after September 1 the Poughkeepsie Bridge route of the New York, New Haven & Hartford is to have 300 cars of freight a day from the Lackawanna road, the increase being due to an arrangement by which perishable freight now going by way of New York City is to be delivered to the New Haven road at Maybrook, N. Y. It is said that this will make the freight movement over the bridge, eastbound and westbound, about 1,500 cars a day.

The Atchison, Topeka & Santa Fe has established five experimental farms along its line at Matagorda, Alvin, Sealy, Kopperl and Gainesville, all in Texas. These farms will be developed by experienced farmers, who will go from farm to farm and who will have a car fully equipped for experimental agriculture, as well as for housing the men in charge. The plan of the railroad company is not to force remarkable crops by artificial means of any sort, but simply to prove to prospective settlers what is possible with modern agricultural methods.

In connection with the electrification of lines in and near New York City the Long Island Railroad is putting up telephone wires along 50 miles of its road and is to have 150 telephones on these wires, all connecting with the superintendent's office at Long Island City. There is to be a telephone at least every 2,000 feet along the road, and where there are not stations or signal cabins, or other offices, boxes will be put up. On the electrified lines, inspectors will be patrolling the road at all times, and by means of the telephones these men can be communicated with promptly at any time.

The passenger cars of the New York Central & Hudson River are being lettered "New York Central Lines," with the letters N. Y. C. & H. R. (small) on the ends of the cars. Similar changes in the passenger equipment of all the New York Central lines will be made as soon as practicable. Many of the freight cars of the various roads already bear the words "New York Central Lines" in an oval design (as here shown), in addition to the name of the road.

The amount of anthracite coal mined in the month of June was 5,844,052 tons, nearly the heaviest month's tonnage on record.

The distribution of the tonnage for June and the six months of 1905 was as follows:

	For June		For year	
	1905.	1904.	1905.	1904.
Reading	1,161,603	1,131,896	6,187,544	5,668,798
Lehigh Valley	980,461	916,306	5,031,052	4,824,482
Jersey Central	700,917	728,185	3,922,054	3,697,244
Del., Lack. & Western	888,273	893,061	4,749,632	4,704,541
Delaware & Hudson	537,450	518,127	2,939,882	2,912,103
Pennsylvania	460,926	473,948	2,507,932	2,371,959
Erie	701,943	682,497	3,142,581	3,007,893
Ontario & Western	271,841	250,699	1,447,642	1,332,039
D., S. & S.	140,638	134,076	788,678	738,148
Totals	5,844,052	5,728,795	30,716,997	29,257,207

Panama Canal.

It is reported that John F. Stevens, Chief Engineer of the Isthmian Canal, has decided to have ten assistants, and that he will fill these positions with eminent engineers, men capable of carrying on the work without the presence of a superior, thus relieving the Chief Engineer of most of the minor details.

The Isthmian Canal Commission has bought from the Ward Line, the American steamers Mexico and Havana. These are to be leased to the Panama Railroad. These two vessels were built for the tropical trade and will be capable of making the round trip in four days' less time than is at present made. The price is said to have been $650,000 each. The purchase was made after careful comparison with foreign-built ships.

New York Subway.

Two additional sections of the New York Subway were opened on July 9, one from the Brooklyn Bridge southward and the other from the Harlem River and Lenox avenue (beneath Harlem River) northward; and the lines are now in operation from South Ferry, at the extremity of Manhattan Island, to the northern terminus at West Farms, near the boundary line of Bronx Park, on the east side, and to Broadway and 157th street (as heretofore) on the west side of the city. The southbound express trains now all go through to South Ferry, where all of the trains run around the loop, except that in the busy hours a part stop at Bowling Green, the next station north of the loop. The South Ferry station is to have passageways to the ferry houses there, but these are not yet finished. That part of the "Subway" north of 149th street is on an elevated structure. This part of the line has been in operation for some months past and the trains running over it have been run to and from the south end of the city over the Second Avenue elevated road. This arrangement is now discontinued, of course.

The line on the west side from 157th street northward is nearly finished, but there are two stations yet to be completed and it is said that it will be two or three months before that section is opened for traffic. Near Fort George, where the line is over 100 ft. beneath the surface, elevators are provided; and it is said that these have been made larger than originally planned. The new station at Mott ave-

nue, north of the Harlem river, on the east side, is one of the largest on the Subway. It has a platform 375 ft. long and in addition to stairways, two elevators are used to carry people the 50 ft. between the station and the street level. A sketch map of the Subway was published in the *Railroad Gazette* of September 16.

Report on the Panama Railroad.

The report of Joseph L. Bristow, Special Commissioner appointed by the President to examine the Panama Railroad, published July 11, concludes with the following recommendations:

That the Panama Railroad be continued as a commercial line; that its facilities for handling commerce be improved at once; that it be double-tracked and re-equipped with modern rolling stock; that its port facilities be enlarged by the construction of additional wharves, and that modern facilities for handling cargoes be provided.

That a schedule of rates for through business be provided, fixing the charges at the minima which the payment of operating expenses and a fair dividend on the investment of the government will permit. The cost of handling freight with improved facilities, and not what it has cost in the past, should be used as the basis in fixing rates.

That the present policy of charging a per cent. of the rates on through business, subject to certain minima, be adhered to.

That the steamship line between New York and Colon be retained.

That the contracts with the Pacific Mail steamship and the South American line be canceled, and the ports of Colon and Panama opened to the use of all steamship lines on equal terms.

That if, within a reasonable time, a regular steamship passenger and freight service is not established between Colon and the gulf ports, a line be established by the Panama Railroad.

That if the Pacific Mail Steamship Co. withdraws its present Panama line, an effort be made to induce some other company to establish a first class service between the important Pacific Coast ports of the United States and Panama, and in the event that no other company is prepared to furnish the service, that it be provided by the Panama Railroad.

That in traffic connections American steamship lines be favored so far as can be done consistently with the treaty obligations of the United States.

American Car and Foundry Company.

During the year ended April 30, 1905, this company built 35,857 cars, including all types and designs. This is a decrease of 30 per cent. as compared with the preceding year. On the other hand, the other business of the company, which amounts to about 20 per cent. of the total, shows an increase over the preceding year. The decrease in car building is largely overshadowed now by the orders on hand, which amount to 44,000 cars. This is the largest amount of orders on hand at this time of year in the history of the company. The figures for earnings for the past three years show the wide fluctuations in the car building business. For instance, total earnings in 1903 were $8,447,030; in 1904, $5,558,879, and in the year ending April 30, 1905, $3,754,274. Net earnings show almost as wide a fluctuation. They were $7,402,631 in 1903; $4,680,112 in 1904, and $2,935,485 in the last fiscal year. In both of the previous years, in addition to the dividend of 7 per cent. on the preferred stock, a dividend of 3 per cent., amounting to $900,000 annually, was paid on the common stock; but in 1905 this dividend was passed. In 1903 the surplus after paying dividends on the preferred was equal to 16 per cent. on the common stock; in 1904 it was 8 per cent., and in the year just past, about 1¾ per cent. The total surplus of the company is $12,755,434.

Fifty Miles an Hour for Two Days.

A press despatch from Chicago, July 11, says that a special train over the Atchison, Topeka & Santa Fe, which arrived in that city at 11.54 a. m., Central time, on that date, from Los Angeles, traversed the distance, 2,244.5 miles in 44 hrs. 54 min., having left Los Angeles at 1 p. m., Pacific time, on July 9. This is at the rate of almost exactly 50 miles an hour, but the distance does not agree with that given in the *Official Guide*. The time is about 13 hours shorter than the best time heretofore made by a special train over this route. (March 27, 1900.) It is said that the time lost in stops was 59 minutes, making the average rate of speed while in motion 51 miles an hour. The train was run to carry Mr. Walter Scott.

Revising Weight Marks on Freight Cars.

The Accounting Officers' Association at its recent convention, passed a resolution requesting the Master Car Builders to agree upon an increase in the allowance (10 cents a car) for re-weighing and re-stenciling foreign freight cars. The auditors find that old and incorrect weights are not erased with sufficient care and promptness.

New Fishing Territory.

The White River division of the St. Louis, Iron Mountain & Southern, between Newport, Ark., and Carthage, Mo., is fast approaching completion and through trains will probably be running by September. Already several thousand tourists have made the trip over the new line, and it is expected that there will be a heavy tourist travel. Excellent fishing may be found at many places and already a number of club houses have been built on the James river between Galena and Branson, and are well filled. Aside from the beautiful scenery on the new line, there are large agricultural and mineral possibilities in the region.

Transfer of Korean Railroads to Japan.

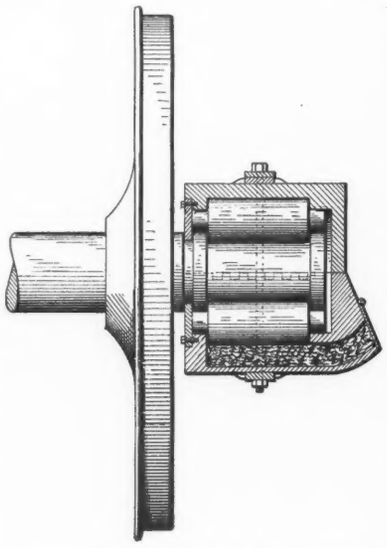
In the Official Gazette of Japan, on April 28, 1905, an agreement was published by which the postal, telegraphic and railroad systems of Korea were transferred to the control of the Japanese Government. The Japanese Government assumed the responsibility of good administration and agreed to bear expenses for all extensions. —*Consular Report.*

Contract for the New United Engineering Building.

The United Engineering Building Committee recently gave a contract to Wells Brothers Co., of New York, for the construction of the United Engineering Building on West Thirty-ninth street in that city at $795,000. This does not include the steam heating plant, electric wiring, etc., but is only for the general construction of the building. The ground is already excavated and the work will begin at once. It is expected that the building will be finished by October, 1906.

Lowry Roller Bearing.

A patent has been granted to A. A. Lowry, Anna, Ill., on a roller bearing for cars, a sectional view of which is shown herewith. The journal box is made in halves with interlocking teeth, the halves being held together by bolts passing through lugs on the sides, there being two bolts on each side. The interior of the box is turned circular, with the exception of a chamber in the bottom of the lower half provided to hold a lubricating material. This chamber has a mouth extending outwardly to the end of the box, the opening being closed by a door, as shown. The rollers have their ends shouldered down to approximately half the body diameter. The axle journal has a wide groove turned in it, into which the rollers fit and have their bearing, the reduced ends bearing on a collar formed on each side of the groove. The journal-box roller chamber has a corresponding shoulder at each end to encircle the roller ends and support the rollers across the lubricating chamber at the bottom. The front of the journal box is closed by a dust-guard formed in halves, secured to the corresponding halves of the box and fitting into a narrow groove in the axle, as shown.



Lowry Roller Bearing Car Journal.

Manufacturing and Business.

The Brooklyn Rapid Transit Company has given a contract to Charles C. Cranford, for painting all its elevated railroad structures. The work will take about one year and will cost $250,000.

It is reported by the London *Standard* that the recommendations of the London Traffic Commission will favor the broad extension of electric traction. Electric cars will be advocated for thoroughfares like the Strand and Piccadilly.

F. W. Bird & Son, East Walpole, Mass., makers of Neponset waterproof paper and Paroid three-ply roofing, announce that the Isthmian Canal Commission has given its first order for roofings and waterproof papers to their company.

The Continental Car and Equipment Co., Whitehall Building, New York City, announces that N. B. Porter, late with the South Baltimore Steel Car & Foundry Co. and the Ryan-McDonald Manufacturing Co., has been appointed its general sales manager.

The American Water Softener Co., Philadelphia, Pa., received two orders for water softening plants from the Norfolk & Western during the month of June, making a total of three orders from this road since April 1 of this year. The last order was for two plants to be installed in the coal lands in West Virginia.

The Electric Dynamic Co., Bayonne, N. J., will exhibit its Inter-Pole variable speed motors at the International Electrical Exhibition to be held at Mechanics Hall, Boston, Mass., July 15th to 22d inclusive. The company is rapidly enlarging its scope of operation

for the Inter-Pole motor and will within the next 90 days be prepared to sell at least 200 varieties of constant and variable speed motors running up as high as 150 h.p.

The Abner Doble Company, of San Francisco, has taken the contract for the machinery for an addition to the hydro-electric plant of the Cramer Electric Company, at Hailey, Idaho. This contract includes a 400-kw. alternator, an 800-h.p. set of water wheels, exciter and governor, switchboards and other accessories, 14 transformers, etc.

The Carolina Company has just been granted a charter in Tennessee. It was organized for the purpose of doing railroad construction work and to secure contracts in connection with the extension of the South & Western Railroad from Spruce Pine southward through the Carolina mountains, to connect with an existing line for the South Atlantic coast. The incorporators include George L. Carter, J. Fred Johnson, T. F. Davis, W. F. Kinsey and J. Norment Powell.

A contract is said to have been given to the General Electric Co. by the Philadelphia & Western for its electrical equipment. The work includes the complete equipment of a temporary and of a permanent power house and of all the passenger cars. The cars are being made by the St. Louis Car Co. The site of the permanent power house has not yet been definitely determined. The temporary power house will be built on Cobb's Creek. Contracts for other equipment, not included in the General Electric contract, will be let at once.

The Railway Electric Power Company has been organized in New York City with a capital of $1,500,000, to introduce the three-phase electric traction system on steam railroads. This system is in use on the Valtellina Line of the Italian State Railways which was described in detail in recent issues of the *Railroad Gazette*. Among the directors of the new company are: John E. Borne, President of the Colonial Trust Company; H. R. Duval, Henry Seligman, William L. Bull, of Edward Sweet & Company; Stephen Peabody and Gustave Leve.

Mr. Ernst Wiener has severed his connection with Arthur Koppel, with whom he has been connected for 18 years, and has opened an office at 68 Broad street, New York City, under the firm name of Ernst Wiener Company. The new company will make railroads and railroad materials for industries, both narrow and standard gage. A factory equipped with modern machinery has been put up in Youngstown, Ohio, for building the specialties of the new firm, so that it is in excellent condition to take care of all business. Associated with Mr. Wiener is Mr. Carl Koch, for many years Chief Engineer of Arthur Koppel, and also a large part of his former staff.

The Thermit Process in American Practice, was the subject of an interesting paper by Ernest Stutz, Vice-President of the Goldschmidt Thermit Company, accompanied by stereopticon views, which was read at the recent annual meeting of the American Society for Testing Materials, at Atlantic City. Illustrations showing the method of welding locomotive frames and driving wheel spokes were given. Mr. Stutz explained that the essential characteristic of thermit is that it welds by fusion and by reason of this fact calls for the foundryman's experience more than for that of the blacksmith. The success of the weld depends on the proper material, and the shape and condition of the mold. Copies of the above paper can be had from the Goldschmidt Thermit Company, New York City.

The Westinghouse Companies are reported to have received two foreign contracts for electrical equipment amounting to $2,000,000. One, taken by the Société Anonyme Westinghouse, calls for the installation of the Westinghouse single phase system on the Bergama-Valle Brembana line in Italy. This is about 20 miles long. The equipment includes five electric locomotives with four 75 h.p. single-phase, multiple-unit control motors. The power station is to have three single-phase, 500 k.w. alternating current generators, to run at a speed of 500 revolutions a minute. The other contract is from the Kanazawa Electric Company, of Kanazawa, Japan, and is for a large hydro-electric light plant to be equipped with Westinghouse rotary alternating 2,200 volt generators of the 60-cycle, three-phase type. This is to be arranged for direct connection of high-pressure horizontal turbines. The working head of water is to be 190 ft., and the generators are to be run at 720 revolutions a minute.

Iron and Steel.

The large demand for rails, averaging about 50,000 tons a week, and the inability of the manufacturers to supply them for August, September and October delivery, it is said, is causing the railroads to offer a premium on the current price.

According to reports from Pittsburg, the Midland Steel Co. will build large works on the north fork of the Ohio river at Cook's Ferry, in Beaver County, Pa., where a site of 1,000 acres has been bought. H. C. Fownes, of the S. Jarvis & Adams Co.; Charles McKnight, of the National Bank of Western Pennsylvania; Joseph McK. Speer and J. Ramsey Speer, are interested. It is proposed to at once put up a blast furnace to have a daily capacity of 450 tons, to which three others will later be added.

MEETINGS AND ANNOUNCEMENTS.

(For dates of conventions and regular meetings of railroad conventions and engineering societies, see advertising page 24.)

Association of American Railway Accounting Officers.

At the seventeenth annual meeting of this association in New York City the election of officers resulted in the choice of Mr. J. O. Clifford (C. & N.-W.), as President; A. H. Plant (Southern), First Vice-President; T. W. Roby (S. A. L.), Second Vice-President, and C. G. Phillips, of Chicago, Secretary. The next meeting of the association will be held at Hotel Champlain, Bluff Point, N. Y., June 27, 1906.

PERSONAL.

—Mr. John L. Moore, formerly General Manager of the Cincinnati, Sandusky & Cleveland, died at Sandusky, Ohio, on June 29.

—Mr. J. T. Robinson, who has been appointed Master Mechanic of the Seaboard Air Line, in charge of the Savannah and Americus shops, was born in Chesterfield County, Virginia, in 1859. For six years, from 1892 to 1898, he was General Foreman for the Southern Railway at Macon, Georgia. In 1898 he was made Master Mechanic at Selma, Alabama, and two years later was transferred to Spencer, North Carolina. In 1904 he left the Southern to go to the Seaboard Air Line as Assistant Master Mechanic, from which position he has recently been appointed Master Mechanic at Savannah.

—Mr. J. H. Travis, who has been appointed Superintendent of Bridges and Docks of the Panama Railroad and Canal, was born July 16, 1878, at Moberly, Mo. He began railroad work in 1889 as a water boy for a bridge gang on the Iowa Central. He worked with this company for three years, and in 1892 went to the Illinois Central. In 1899 he was appointed Assistant Bridge Foreman, and in 1902, Bridge Foreman. In 1904 he was appointed Supervisor of Bridges and Buildings of the Dubuque division. In February, 1905, he was made Supervisor of Bridges and Buildings of the Western division of the Missouri Pacific and of the Central Branch. He left this position in May for his present appointment on the Isthmus.

—Mr. J. W. Daniels, who has been appointed Superintendent of the Missouri division of the Missouri Pacific and the St. Louis, Iron Mountain & Southern was born in Missouri in 1870. He began railroad work at the age of 13 on the St. Louis & San Francisco at Springfield, Missouri. When he was 14 years old he was a night operator and at 20 was promoted to be despatcher. In 1893 he went to the Iron Mountain as despatcher. He was soon made chief despatcher and in 1902 was transferred to the Missouri division. On Dec. 1, 1903, he was appointed trainmaster of the Missouri division, from which position he was on June 10 promoted to be Superintendent.

—Mr. David Lee, Consulting Engineer of the Baltimore & Ohio, died in Zanesville, Ohio, on June 29, at the age of 76 years. He had been on the Baltimore & Ohio since 1851, having been Bridge Carpenter, Superintendent of Road, Roadmaster, General Superintendent, Superintendent of Maintenance of Way until Jan. 1, 1902, when he was appointed to his last position.

—Mr. H. P. Latta, who has been appointed Superintendent of Motive Power of the Mobile, Jackson & Kansas City, with headquarters at Mobile, Alabama, began railroad work in 1877 as an apprentice in the Elkhart shops of the Lake Shore & Michigan Southern. In 1883 he was made Roundhouse Foreman at Jackson, Michigan, and in 1884 Roundhouse Foreman at Air Line Junction, Toledo. In 1889 he was appointed Master Mechanic of the Norwalk shops. He went to the Chicago & Erie two years later as Master Mechanic at Huntington, Indiana, but soon left that road to go into private business, where he remained for two years. He came back to the railroad service in 1893 as General Foreman of the shops of the Ohio Central Lines at Toledo, and in 1903 was appointed Master Mechanic of the Toledo Railroad & Terminal Company. This position he has now resigned to go to the Mobile, Jackson & Kansas City as Superintendent of Motive Power.

—Mr. Martin Adson, who has been appointed General Passenger Agent of the Duluth, South Shore & Atlantic and the Mineral Range, was born in 1872 and entered the service of the Duluth, South Shore & Atlantic in August, 1893, at the age of 21 as a stenographer in the city ticket office at Duluth. From 1894 to 1898 he was ticket clerk and cashier at the Superior city office, and later at the Duluth city office, and in July, 1898, was made traveling passenger agent. In March, 1901, he was appointed General Agent of the road at Duluth, from which position he is now promoted to be General Passenger Agent. His office will be at Marquette, Mich.

—Mr. W. G. Bean, of Winchester, Mass., who recently resigned as Superintendent of the Boston division of the Boston & Maine Railroad, died at Rangeley, Maine, on June 29. Mr. Bean was about 45 years of age.

—Mr. R. H. Ingram, the first General Superintendent of the new Southern district of the Southern Pacific, with headquarters at Los Angeles, was born in Kentucky and entered railroad service as cashier for the Pullman Co. He next went to the Louisville & Nashville as chief clerk and afterwards as Assistant Comptroller. He was appointed Auditor of the Ohio Valley in July, 1887, but returned to the Louisville & Nashville in 1889 as Assistant to the President. In 1896 he went with Mr. Charles M. Hays when Mr. Hays was appointed General Manager of the Grand Trunk, being made Secretary and Treasurer of the Central Vermont when the Grand Trunk acquired control of that road. Mr. Hays was later made President of the Southern Pacific, and Mr. Ingram accompanied him as Assistant to the President. On Mr. Hays' retirement in 1902, Mr. Ingram was appointed Superintendent of the Los Angeles division, from which he has been promoted to be General Superintendent of the Southern district.

—Mr. D. C. Noonan, who has been appointed Superintendent of the Minneapolis & St. Louis, has spent his entire railroad life on this road. From April, 1890, to January, 1902, he was in the supply, traffic and transportation departments. For the last three years he has been Chief Clerk in the office of the Vice-President and General Manager of the Minneapolis & St. Louis and the Iowa Central. From this position he was promoted to be Superintendent, with jurisdiction similar to that of the former General Superintendent.

ELECTIONS AND APPOINTMENTS.

Alabama Great Southern.—See Cincinnati, New Orleans & Texas Pacific.

Arizona & New Mexico.—George Wagstaff has been appointed Superintendent.

Arizona & Utah.—W. G. Taylor, Auditor of the Atchison, Topeka & Santa Fe (Coast Lines), has been appointed Auditor.

Arkansas South-Western.—The authority of the Traffic and Accounting Departments of the Missouri Pacific has been extended over this road.

Atchison, Topeka & Santa Fe.—T. H. Sears, Trainmaster at Marceline, Mo., has been appointed Superintendent of the Missouri Division, with headquarters in Marceline, succeeding R. J. Parker, promoted.

Atlantic & North Carolina.—W. L. Bird has been appointed Auditor, succeeding W. B. Starke, with headquarters at Goldsboro, N. C.

Atlantic Coast Line.—C. M. James, late Assistant Engineer on the Baltimore & Ohio, has been appointed Acting Engineer of Roadway on the First Division, with headquarters at Wilmington, N. C., succeeding George B. Huske.

Boise, Nampa & Owyhee.—W. H. O'Neil has been appointed General Traffic Manager and Auditor of this road and the Idaho & Northern, succeeding R. E. L. Shore, resigned.

Canadian Pacific.—The authority of H. E. Beasley, Division Superintendent at Vancouver, B. C., has been extended over the Esquimalt & Nanaimo.

The office of George H. Smith, Assistant General Freight Agent, has been removed from Calgary to Winnipeg.

Chicago & Eastern Illinois.—The office of G. H. Trenary, Superintendent, has been removed from Villa Grove to St. Elmo, Ill.

Chicago, Burlington & Quincy.—Jacob Kastlin, Assistant Master Mechanic at Galesburg, Ill., has been appointed Master Mechanic at St. Joseph, Mo., succeeding J. H. Dacey, resigned.

Chicago Great Western.—Tracy Lyon has been appointed Assistant General Manager.

Chicago, Peoria & St. Louis of Illinois.—J. K. Howard, Engineer of Maintenance of Way of the Wabash, at Peru, Ind., has been appointed Engineer of Maintenance of Way.

The office of L. P. Atwood, Engineer of Maintenance of Way, has been removed from Alton to Springfield, Ill.

Chicago, Rock Island & Pacific.—Hereafter on this road and on the St. Louis, Kansas City & Colorado, General Managers, General Superintendents and Division Superintendents will have charge of the maintenance of the property. Division Engineers will report to Division Superintendents in all matters pertaining to the maintenance of the property, and will make such reports and perform such duties as may be required by the Engineer of Maintenance. Engineers of Maintenance will report to General Managers in all matters pertaining to the maintenance and improvement of the operated lines, and will make such reports and perform such engineering duties as are required by the Chief Engineer. The Bridge Engineer and Signal Engineer will report to the Chief Engineer. The Chief Engineer's office will be the office of record for the system. The Chief Engineer will approve all standard plans and all plans for bridges and important structures.

J. G. Bloom has been appointed Engineer of Maintenance of the Southwestern and Choctaw districts of the Chicago, Rock Island & Pacific, and of the St. Louis, Kansas City & Colorado, with headquarters at Topeka, Kan.

H. F. White has been appointed Engineer of Maintenance of the Central and Northern districts, with headquarters at Chicago, Ill.

Charles H. Hubbell, Superintendent of Terminals at Chicago, has been appointed General Superintendent of the Central District, with headquarters at Chicago.

It is announced that hereafter on this road and on the St. Louis, Kansas City & Colorado, distribution of all cars will be managed by the office of Assistant to the Second Vice-President.

The office of Superintendent of Car Service has been abol-

ished, and G. P. Johnson, who held that position, has been appointed Car Accountant.

A. C. McColl, Trainmaster at Herington, Kan., has been appointed Division Superintendent at Chickasha, Ind. T., succeeding H. M. Hallock.

Cincinnati, Flemingsburg & Southeastern.—The Covington, Flemingsburg & Ashland has been purchased by this road, which has organized with the following officers: Attilla Cox, President, Louisville, Ky.; C. D. Lanier, Vice-President, New York; W. N. Cox, Secretary and Treasurer; Attilla Cox, Jr., General Counsel; S. S. Bush, General Manager, all with headquarters at Louisville, Ky., and R. L. Dudley, Superintendent, Flemingsburg.

Cincinnati, New Orleans & Texas Pacific.—I. F. Hall, Superintendent of Car Service of this road and of the Alabama Great Southern, has been appointed Assistant to the Chief Engineer of both roads.

Cleveland, Akron & Columbus.—Samuel Moody, General Passenger Agent of the Pennsylvania, has been appointed General Passenger Agent of this road also.

Cleveland, Cincinnati, Chicago & St. Louis.—L. J. Hackney has been appointed General Counsel.

The title of E. E. Kruthoffer has been changed from Freight Accountant to Auditor of Freight Accounts, and that of F. M. Brine from Ticket Accountant to Auditor of Passenger Accounts.

Colfax Northern.—The officers of this company are as follows: J. L. Parish, President; J. B. Ryan, Vice-President; both with headquarters at Des Moines, Iowa; Frank B. Hooper, Secretary and General Manager; L. Bates, Treasurer; both with headquarters at Colfax, Iowa.

Colorado & Southern.—John H. Bradbury has been appointed Assistant General Auditor, with headquarters at Denver, Colo.

Coronado.—Geo. Wagstaff is Superintendent.

Denver & Rio Grande.—D. G. Sloan has been appointed Assistant Superintendent of the Rio Grande Western, with headquarters at Salt Lake City, Utah.

Dover & South Bound.—Officers of this company are as follows: W. A. Wimsatt, President, with headquarters at Washington, D. C.; D. W. Richardson, Vice-President and General Manager; W. B. H. Blandford, Secretary and Treasurer; J. S. Wooten, Superintendent; N. S. Richardson, Traffic Manager; W. R. Hinnant, Roadmaster; Raymond Pollock, M.D., Chief Surgeon; all with headquarters at Dover, N. C.

El Paso-Northeastern.—James Douglas has been elected President of the companies of this system, with headquarters at New York. A. C. James has been elected Vice-President of the New Mexico Railway & Coal Company; El Paso & Northeastern Railway (in New Mexico); El Paso & Rock Island; Alamogordo & Sacramento Mountain, and the Dawson Railway. His office is in New York. H. J. Simmons has been elected Vice-President as well as General Manager of the El Paso & Northeastern (in Texas); A. L. Hawley, Secretary and Auditor, and J. S. Wright, Treasurer; all with headquarters at El Paso, Tex. F. H. Ross has been elected Treasurer of the Dawson Railway, office at New York.

Erie.—Robert Gunn, Master Car Builder at East Buffalo, has been appointed Superintendent of these shops. Thomas Tracy, General Foreman of shops at Kenton, O., has been appointed Assistant Master Car Builder at Meadville, Pa.

Georgia, Florida & Alabama.—E. B. Eppes is Chief Engineer of Construction of this road and the Carrabelle, Tallahassee & Georgia, with headquarters at Cuthbert, Ga.

Georgia Southern & Florida.—William Checkley Shaw has been appointed Assistant to the President, with headquarters at Macon, Ga.

Gila Valley, Globe & Northern.—W. R. Martin has been appointed Superintendent with headquarters at Globe, Ariz., taking the place of A. M. Beal, who has been granted a leave of absence.

Great Central (of Nicaragua).—Robert Pitcairn has been elected Chairman of the Board of Directors, and Thomas B. Riter, President; both with headquarters at Pittsburg, Pa.

Great Northern.—J. M. Schweizer, Chief Clerk to the Superintendent at Willmar, Minn., has been appointed Assistant Superintendent of the Northern division, with headquarters at Grand Forks, N. Dak. R. C. St. John, Assistant Superintendent of the Northern division, has been appointed Assistant Superintendent of the Breckenridge division, with headquarters at Breckenridge, Minn., succeeding G. S. Stewart, promoted.

Kansas City Southern.—H. R. Duval has been appointed Vice-President and R. B. Sperry has been appointed Secretary and Transfer Agent; both with headquarters at New York. The title of F. W. Meyer has been changed from Auditor of Receipts to Freight and Passenger Accountant.

Louisville & Nashville.—Addison B. Smith, heretofore General Freight and Passenger Agent of the Atlanta & West Point and the Western of Alabama, has been elected Third Vice-President of the Louisville & Nashville, with headquarters at Louisville.

Louisiana & Northwest.—George W. Hunter has been elected Treasurer, with headquarters at St. Louis, Mo. A. R. Porterfield has been elected Secretary and Auditor, with headquarters at Ruston, La.

Michigan Central.—The construction of the Detroit Tunnel Line from Windsor, Ontario, to West Detroit Yard, Michigan, including the electrification thereof, has been placed in charge of an Advisory Board of Engineers, consisting of William J. Wilgus, Vice-President of the N. Y. C. & H. R.; Howard Carson, Consulting Engineer, and W. S. Kinnear, Chief Engineer of the Tunnel Company. The Chief Engineer will be in direct charge of construction, reporting to H. B. Ledyard, Chairman of the Board of Directors, on executive and financial matters, and to the Board of Advisory Engineers as to plans, specifications and methods of doing the work.

Midland Valley.—Eugene Mock, Chief Clerk in the freight department, has been appointed Assistant General Freight Agent. George H. McConnell, Chief Clerk in the passenger department, has been appointed Assistant General Passenger Agent. The headquarters of both will be at Fort Smith, Ark.

New York Central & Hudson River.—G. W. Vaughan, Division Engineer of the Western division, has been appointed Engineer of Maintenance of Way with headquarters at New York, succeeding A. T. Hardin, promoted. D. L. Sommerville, Division Engineer of the Pennsylvania division, has been appointed Division Engineer of the Western division with headquarters at Buffalo, succeeding Mr. Vaughan. B. M. McDonald, Supervisor at Albany, has been appointed Division Engineer of the Pennsylvania division with headquarters at Jersey Shore, Pa., succeeding Mr. Sommerville.

C. K. Lawrence, formerly Resident Engineer on various parts of the road, has been appointed Resident Engineer, in charge of four-tracking and structural work in connection with the electrification of the suburban district from Croton-on-Hudson to the Harlem River drawbridge, New York City.

New York, New Haven & Hartford.—H. P. Callendar, General Foreman of the New Haven shops, has been appointed Master Mechanic of the Providence Division, succeeding F. M. Twombly, resigned.

Northern Central.—See Pennsylvania.

Pennsylvania.—A. B. Cuthbert, Assistant Engineer at Pittsburg, Pa., has been appointed Assistant Engineer of the Philadelphia division, with headquarters at Harrisburg, Pa., succeeding J. K. Stewart, relieved on account of ill health. J. J. Rhoads, Superintendent at Tacony, Pa., has been appointed Assistant Engineer of the Eastern and Susquehanna division and of the Northern Central at Williamsport, Pa., succeeding E. B. Wiseman, transferred.

Peoria & Pekin Terminal.—The General Freight Agent of this company is George F. Nevins.

Pontiac, Oxford & Northern.—F. H. Carroll, Auditor, has also been appointed General Freight and Passenger Agent and Acting Superintendent, with headquarters at Pontiac, Mich.

St. Louis, Iron Mountain & Southern.—S. H. Busby, General Foreman of the Bridge and Building Department at the Baring Cross shops, has been appointed Division Engineer of the Central division, with headquarters at Van Buren, Ark.

St. Louis, Kansas City & Colorado.—See Chicago, Rock Island & Pacific.

Southern.—G. L. Best, Acting Superintendent of Dining Cars, has been appointed Superintendent of Dining Cars.

Southern Pacific.—The offices of Manager and Assistant Manager of Purchases and Supplies have been abolished. I. O. Rhoades has been appointed General Purchasing Agent and H. W. Ellicott, Assistant General Purchasing Agent.

Tennessee Central.—T. A. Rousseau, Chief Clerk, will take charge of the Traffic Department with the title of Chief Clerk, succeeding E. H. Hinton, Traffic Manager. The headquarters of the Treasurer have been moved to St. Louis.

Texarkana & Ft. Smith.—J. A. Edson, President of the Kansas City Southern, has been also elected President of this road, with headquarters at Kansas City, Mo. W. D. Sanders has been appointed Claim Agent, and T. E. Jarret, Superintendent of the Kansas City Southern, has been appointed Superintendent, both headquarters at Texarkana, Tex.

Toledo, St. Louis & Western.—C. R. Duncan has been appointed Superintendent of Telegraph and Chief Despatcher, with headquarters at Frankfort, Ind., succeeding A. W. Early.

Tonopah.—T. Thornton has been appointed Acting Auditor, W. F. Towne having resigned. George P. Schaefer has been appointed Assistant Auditor.

Ultima Thule, Arkadelphia & Mississippi.—The officers of this company are as follows: William Grayson, President; N. W. McLeod, Vice-President; W. E. Grayson, Secretary and Treasurer; all with headquarters at St. Louis, Mo.; M. J. Hale, Auditor, and C. G. Carpenter, General Manager; with headquarters at Arkadelphia, Ark. This road has just been put in operation, and is 24 miles long.

Vera Cruz & Pacific.—M. J. Schneider, having resigned as Superintendent, W. A. Hill has been appointed Superintendent and Chief Engineer.

Wabash-Pittsburg Terminal.—W. M. Bonar has been appointed Assistant Secretary and Auditor. J. G. Stidger has been appointed Assistant Treasurer. The headquarters of both are at Pittsburg.

Western Pacific.—George L. Dillman has been appointed Supervising Engineer, in immediate charge of construction.

Williamsport & North Branch.—R. J. Weishaupt has been appointed Freight Claim and Purchasing Agent; D. K. Townsend, Superintendent of the main line; George M. Case, General Freight and Passenger Agent, all with headquarters at Hughesville, Pa.

Wilmington & Powellsville.—J. J. Harrison has been appointed General Freight and Passenger Agent, with headquarters at Windsor, N. C., succeeding J. L. Bell.

LOCOMOTIVE BUILDING.

The Delaware, Lackawanna & Western is reported to have ordered six fast passenger locomotives.

The Cuba Central has ordered six large compound locomotives from the Baldwin Locomotive Works.

The United Railways of Havana have ordered eight large locomotives from the Baldwin Locomotive Works.

The Illinois Central has ordered five simple Pacific type (4-6-2) passenger locomotives from the American Locomotive Co. These locomotives are to weigh 225,000 lbs.

The Lake Shore & Michigan Southern has ordered 5 ten-wheel (0-10-0) switching locomotives from the American Locomotive Co. These locomotives are to be equipped with Walschaert valve gear.

The Mississippi Central has ordered three ten-wheel (4-6-0) locomotives and one American type (4-4-0) locomotive from the Baldwin Works. The ten-wheel locomotives are to weigh 140,000 lbs. and the American type, 110,000 lbs.

The Bergama-Valle Brembana line in Italy has ordered five electric locomotives from the Westinghouse Companies. They will be equipped with four 75 h.p. single phase multiple unit control motors. The trolleys will be of the pneumatically operated type.

CAR BUILDING.

The Mississippi Central has ordered four passenger cars from Barney & Smith.

The Spokane & Inland has ordered twenty 36-ft. flat cars of 60,000 lbs. capacity from the American Car & Foundry Co., for August delivery.

The Victorian Railways of Australia have ordered from the J. G. Brill Co. a number of California type cars. The California type is open at both ends with a closed compartment about one-half the length of the car in the center.

The Chicago & Eastern Illinois is reported to have ordered 1,400 Otis self-clearing gondolas, 750 steel under-frame box cars, and 250 Otis self-clearing box cars from the American Car & Foundry Co., and 100 self-clearing gondolas from the Pressed Steel Car Co.

The St. Louis & San Francisco, as reported in our issue of June 23, has ordered 500 gondola coal cars, 400 Otis self-clearing coal cars, and 500 twin-hopper self-clearing coal cars from the American Car & Foundry Co., and 100 self-clearing coal cars from the Pressed Steel Car Co.

The Atchison, Topeka & Santa Fe has ordered two chair cars and one coach from the Pullman Co. These cars will be 69 ft. 2½ in. long, 9 ft. 2 in. wide and 9 ft. 5 in. high, all inside measurements. The special equipment will include: National-Hollow brake beams, National couplers, Forsyth curtain fixtures, Pantasote curtain material, Miner draft rigging. Pullman standard heating system and trucks, Symington journal boxes and Pintsch light.

The British Columbia Electric is building for the Lulu Island electric line, recently taken over, a number of large interurban cars. They will be equipped with 200 h.p. motors by the Canadian Electric Company. The special equipment includes: J. G. Brill Co.'s trucks, air-brakes from the Canadian Foundry Co., Sterling-Meaker auxiliary hand-brakes and portable telephone instruments.

The New York City Interborough Railway has ordered 10 semi-convertible cars from the J. G. Brill Co. These cars will measure 28 ft. over bodies, 38 ft. over vestibules, width 7 ft. 11½ in. over sills, and 8 ft. over posts at belt; length of platforms, 5 ft. The improved method of raising the sashes into pockets in the side roof known as the "grooveless post" method is called for in the specifications. The vestibule entrances will have Brill folding gates instead of doors. The cars are to be mounted on the builders' No. 27-G-1 short-base double-trucks.

BRIDGE BUILDING.

Baltimore, Md.—The Western Maryland, according to local reports, has given a contract to the Pennsylvania Steel Co. for rebuilding two bridges on the West Virginia Central, one over the Potomac at Gerstell and one at Dawson; also for four on the Western Maryland; one over Antietam creek west of Edgemont, over Marshy run east of Hagerstown, over the Conococheague at Williamsport and over the Little Conococheague.

Birmingham, Ala.—Bids are wanted July 17 by the Board of Revenue for building four steel bridges in Jefferson County. John T. Reed is President.

Binghamton, N. Y.—Bids are wanted July 17, by the Common Council, for building a bridge over Chamberlain creek at Robinson street. H. C. Herrick is City Clerk.

Charleston, W. Va.—Bids are wanted July 20, by the City Council, for building a truss bridge, with roadway of 22 ft. and sidewalks 6 ft. each, over Elk river. W. A. Hogue is City Engineer.

Hartford, Conn.—Bids are wanted July 19, by the board, for building the foundation and substructure of a highway bridge over the tracks at Albany avenue. Joseph Buths is President.

Houghton, Mich.—A contract has been given to the Wisconsin Bridge & Iron Co. at its bid of $70,922 for building a drawbridge over Portage Lake connecting this place and Hancock. The contract calls for the completion of the work by April 1 of next year.

Knoxville, Tenn.—A contract has been given to William J Oliver & Co., of Knoxville, for building the West Clinch avenue viaduct to cost about $75,000.

Listowel, Ont.—Bids are wanted by W. E. Dinning for building steel bridges on Main and Wallace streets 300 ft. long; also a steel bridge on Elma street with concrete abutments.

Menominee, Wis.—Separate bids are wanted July 15, by the city authorities, for the substructure and the superstructure of a bridge to be built over the Red Cedar river. F. W. Rowe is City Clerk.

Montezuma, Ga.—Bids are wanted July 20, by the Atlanta, Birmingham & Atlantic, for approximately 9,000 yds. of concrete arches, piers and abutments, to be built along its road between this place and the Chattahoochee river, about eight miles west of Lagrange. Separate bids will also be received for approximately 2,500,000 ft. B. M., of trestling, to be built between Paschal, Ga., and Chattahoochee River. Alex. Bonnyman, Ch. Engr., at Oglethorpe, Ga.

Naponee, Neb.—Bids are wanted July 24 by John Parker, County Clerk, for building a two span steel bridge over the Republican river.

Passaic, N. J.—The second set of bids recently opened by the bridge committee for building the drawbridge over the river at the foot of Gregory street were for a structure with wooden and for a structure with creosoted pavement, as follows: Owego Bridge Co., $64,500, $69,500; F. M. Stillman, $66,500, $70,300; Canton Bridge Co., $65,000, $70,300; Dean, Schwiers & Sutton Co., $74,950, $78,000; F. R. Long Co., $66,912, $71,400; West Virginia Bridge & Construction Co., $73,500, $75,000; New Jersey Bridge Co., $69,300.

Pollasky, Cal.—Bids will be asked about July 17 by the Board of Supervisors of Fresno County for putting up a Pratt truss steel bridge 785 ft. long over the San Joaquin river for the joint account of Fresno and Madera Counties, at a cost of about $30,000. Scott McKay, of Fresno, is County Surveyor.

Tyson's Mill, Pa.—Bids will soon be asked by the County Commissioners for building a steel bridge on stone abutments at this place.

Virginia City, Mont.—Bids are wanted September 8, by the Board of County Commissioners of Madison County for building two steel bridges over the Big Hold river at the Pennington bridge site seven miles from Twin Bridges.

West Newton, Pa.—The County Commissioners have given

a contract to the Penn Bridge Co., of Beaver Falls, Pa., at $67,885, for building the steel bridge over the Youghiogheny river at this place.

RAILROAD CONSTRUCTION.

New Incorporations, Surveys, Etc.

ALABAMA ROADS.—A railroad is projected to be built from Dothan, Ala., south to St. Andrews Bay, Fla., on the gulf coast, a distance of about 100 miles. The project is said to be backed by the Enterprise Lumber Co., of Atlanta, Ga., of which H. M. Steele is President.

ALBANY & NORTHERN.—This company, which operates a road from Cordele, Ga., southwest to Albany, a distance of 35 miles, has decided to extend its road from the latter place in a southwesterly direction through Dougherty, Baker and Decatur counties in Georgia, passing through Colquitt, in Miller County, and thence through Marianna, in Jackson County, Fla., west to Pensacola, a total distance of about 225 miles.

BARBERTON, WADSWORTH & WESTERN.—A meeting of the directors of this road is to be held to complete arrangements for at once building the road from Barberton, in Summit County, Ohio, west to the Medina County line, a distance of five miles.

CANADIAN NORTHERN.—Work has been commenced on the cut-off from Vassar west to Ridgeville, Man., about 70 miles, to make a direct line between the wheat district and the lake ports. By this line the distance will be shortened about 25 miles.

CANADIAN PACIFIC.—Announcement has been made that this company, which recently bought the Esquimalt & Nanaimo, will at once make surveys for extending the line to the north end of Vancouver Island.

Surveys have been completed and bids will soon be asked by this company for the construction of the new line east and west of Saskatoon, N. W. T. The eastern extension of this line will connect with the Pheasant Hills branch, which at present is almost ready for operation as far as Strassburgh, about 90 miles from Saskatoon. Work is progressing slowly on the second sections of the new lines east from Wetaskiwin and Lacombe, N. W. T. The first section on these branches, which are each 25 miles long, will be ready for operation this fall, but the second sections will not be ready until next spring.

This company will at once commence the construction of a branch line north of Winnipeg to shorten the route from the wheat fields to the lake ports. The new line will cross the Red River at St. Andrews, 15 miles north of Winnipeg, where a double track steel bridge will be built. It is expected that this line will be built this summer so as to be ready to carry the fall crops and obviate congestion at Winnipeg.

COLORADO, WYOMING & IDAHO.—This company, which is capitalized at $10,000, and which some time ago obtained a charter in Wyoming, has recently been granted a charter in Idaho. The road is projected to run from Denver, Colo., northwest to Laramie, Wyo., and thence west to St. Anthony and Boise, Idaho, a distance of about 750 miles. W. R. West, of Laramie, Wyo.; J. Underwood, of Chicago, Ill.; F. H. Stuart, of Boston, Mass.; J. S. Christian, of Danville, Ill., and others are interested. (See Construction Record.)

DENVER & RIO GRANDE.—Track laying has been begun on the first 18 miles of the Durango-Farmington extension of this road.

DENVER, ENID & GULF.—This road has been extended from Coldwater, Okla. T., west to Nashville, eight miles. The proposed route extends to Hays, Kan., 170 miles.

FAYETTE & FAYETTEVILLE.—Under this name a company has been incorporated in West Virginia to build a railroad from Fayette southwest, crossing the New river, to Fayetteville, a distance of about five miles.

FOX RIVER VALLEY.—The City Council of Manitowoc, Wis., has passed an ordinance granting a 35-year franchise to this company, which will build a bridge to cost about $50,000 at this place on its proposed interurban road from Sheboygan north to Manitowoc and thence northwest to Kaukauna, a distance of about 60 miles.

GEORGIA, FLORIDA & ALABAMA.—Work has been begun by this company on an extension from Havana, Fla., southwest to Quincy, on the Seaboard Air Line, a distance of about 12 miles.

ILLINOIS CENTRAL.—Contracts have been let by this company for double track work between Atoka and Millington, Tenn., about 13 miles. The old roadbed will be abandoned almost the entire distance between these two points and the station at Tipton, Tenn., will be moved west one mile. When the contract is completed the Illinois Central will have a double track between Chicago and Memphis with the exception of 12 miles between Woodstock and Memphis. This is to be concluded by building a belt line west of the city from Woodstock, running to Nonconnah yards, south of Memphis.

JAMES BAY.—D. D. Mann is quoted as saying that work will be commenced almost immediately on a branch from Toronto northeast to Ottawa, about 175 miles.

LORAIN & ASHLAND.—Under this name a charter has been granted to associates of Joseph Ramsey, Jr., in Ohio, to build a line to connect together the lines of the Little Kanawha syndicate to reach coal in West Virginia in case the Vanderbilt interests do not take over the holdings of the syndicate.

MENA & SOUTHEASTERN.—A charter has been granted this company in Arkansas with a capital of $400,000 to build a railroad from Mena, in Polk County, on the Kansas City Southern, east to Black Springs, in Montgomery County, a distance of about 40 miles. Survey has been completed and construction work will begin at once. C. C. Goodman, C. A. Smith, J. H. Hamilton and others, of Mena, Ark., and J. H. Foster and V. R. Andrews, of Kansas City, are interested. This is probably a project of the Kansas City Southern.

MEXICAN CENTRAL.—An officer writes that about six miles of grading on the extension from Tuxpan to Colima have been completed; also one tunnel. No track has as yet been laid. The work is heavy, with a maximum grade of 2 per cent. and 9-deg. curves. There will be 11 bridges and 12 tunnels. Hampson & Smith are the contractors.

MUSKOGEE & TEXAS.—A charter has been granted this company in Oklahoma, with a capital of $4,000,000, to build a railroad from Cushing, Okla. T., east through Payne County and the Creek nation to Muskogee, thence south through the Choctaw nation to Honey Grove, in Fannin County, Texas, a distance of 250 miles. The incorporators are: Horace Speed and Thomas J. Low, of Guthrie; W. Eaton, H. G. Baker and N. R. Maskell, of Muskogee.

NORFOLK & WESTERN.—The Tug Fork branch of the Pocahontas division has been extended from Garey, in McDowell County, W. Va., a distance of eight miles.

OCONEE COUNTY.—Application has been made by a company under this name in South Carolina with a capital of $200,000 to build a railroad from Westminster, S. C., on the Southern, south to Fair Play, a distance of 12 miles. The incorporators include: W. P. Anderson and William Bibb, of Westminster; A. W. Shelor, of Walhalla; J. J. Halley and L. A. Edwards, of Oakway; J. R. Heller, of Fair Play; J. W. Shirley, of Townville, and others.

PEORIA, PEKIN & SOUTHEASTERN.—Incorporation has been asked by a company under this name in Illinois, with a capital of $100,000 to build a railroad from Pekin south through Tazewell, Mason, Menard, Sangamon, Christian and Montgomery counties to Ramsey, in Fayette County, about 130 miles, where connection will be made with the Toledo, St. Louis & Western. Connection will be made at the northern end with the Chicago & North-Western, giving the latter road a connection to the south. It is proposed to enter Peoria over the Terminal Company's tracks from Pekin. The principal office will be in Peoria. The incorporators and first board of directors include: Guy Talbott, Robert P. Jack, W. T. Irwin and E. A. Borrill, of Peoria; P. L. Saltonstall, of Boston, Mass., and W. H. Trumbull, of Salem, Mass.

PINEY RIVER & PAINT CREEK.—Announcement has been made that a new railroad will be built by the MacDonald Colliery Co. from Beckley, in Raleigh County, W. Va., north to a point near the mouth of Mossy creek, in Fayette County, connecting with the Deepwater Railroad.

SAGINAW & SOUTHWESTERN.—Incorporation has been granted a company under this name in Michigan, with a capital of $50,000, to build a railroad from Saginaw southwest via St. Charles, Chesaning and Elsie to St. John's, about 50 miles, where connection will be made with the Lansing & Suburban. The directors include: A. S. Courtright, of Lansing; W. G. Emerick, W. S. Linton, E. P. Waldron and C. E. Linton, of Saginaw. The offices of the company will be at Saginaw.

ST. LOUIS, IRON MOUNTAIN & SOUTHERN.—Announcement has been made that the new White River division of this road, from Newport, Ark., northwest to Carthage, Mo., about 200 miles, has been practically completed and that trains are being run. Through traffic will be established within 60 days. A further shortening of this line will be made when the branch from Newport southeast to Wynne, about 38 miles, is completed. This work will be commenced at once.

ST. MAURICE VALLEY.—A bill has been passed by the railway committee of the Canadian Parliament authorizing the building of a railroad from Three Rivers, Que., to a point on the line of the proposed eastern division of the Grand Trunk Pacific.

SANGAMON VALLEY.—Incorporated in Illinois to build a railroad from Decatur west to Quincy about 150 miles; also branches from the proposed route at Springfield and Petersburg. G. M. Skelly, J. E. Melick. J. S. Sutton, C. F. Morrow, of Springfield, and others are interested.

San Pedro, Los Angeles & Salt Lake.—Preliminary arrangements have been completed between this company and the Nevada-Utah Mining Co. for the construction of a branch line by the former from Caliente, Nev., north to Pioche, a distance of 30 miles, opening up a mining district which once was a famous Nevada bonanza camp. The entire distance between Pioche and Caliente was graded for a proposed narrow-gage road some years ago so that now little needs to be done but lay the track.

Shamokin & Edgewood (Electric).—Plans have been completed by New York, Philadelphia and local capitalists, including M. H. Kulp, to rebuild the electric road from this place northwest to Sunbury, a distance of about 12 miles, at an estimated cost of $1,500,000.

Somerset Railway.—An officer writes that this company has about four miles of grading completed on its proposed road from Deadwater, Somerset County, Me., through Mayfield and the townships of West Moxie and Squaretown to Indian Pond, where a crossing is made over the Kennebeck river, thence north to a junction with the Canadian Pacific at some point in Asqueth, and thence north about six miles to Birchpoint, in Tomhegan, a total distance of 41 miles. The general contract has been given to J. G. White & Co., of New York City, and other contracts have been let for track laying and bridge work. Track laying will be commenced this fall and, it is expected, will be finished early next spring. The work is light, the maximum grade being 1 per cent. There will be four steel bridges.

Stone Canyon.—Incorporation has been granted this company in California, with a capital of $300,000, to build a railroad from San Miguel on the Southern Pacific, north through San Luis Obispo and Monterey counties to Nelson Creek, a distance of 21 miles. The directors include: J. A. Chanslor, W. A. Sloan, W. G. Stafford, I. W. Hellman and E. W. Mason.

Tennessee Central.—This company has changed the plans for its northern extension and will probably build a line from Clarksville, Tenn., up the Cumberland River to the Ohio River, as well as extend the Hopkinsville line to Paducah.

RAILROAD CORPORATION NEWS.

Atchison, Topeka & Sante Fe.—Pfaelzer & Company, of New York, are offering at par $1,000,000 Eastern Oklahoma division first mortgage gold 4 per cent. bonds of 1928. These are part of an authorized issue of $10,000,000, of which $6,128,000 are outstanding.

Buffalo Railway (Electric).—Kean, Van Cortlandt & Co., of New York, are offering at 114 $1,000,000 first mortgage 5 per cent. gold bonds of 1931 of this company, part of an authorized issue of $5,000,000; all of which is outstanding, except $293,500 reserved to retire a prior lien maturing in 1912.

Cincinnati, Hamilton & Dayton.—Mason, Lewis & Co. have recently offered at 95 a block of $1,250,000 4 per cent. refunding 50-year bonds of 1954. These are part of an authorized issue of $25,000,000. Of this issue $15,023,000 are reserved for refunding the same amount of prior lien bonds, $2,595,000 of which mature this year and $2,728,000 in 1911. Subject to the underlying liens the refunding bonds are a direct mortgage on about 1,000 miles of railroad and on $11,000,000 common stock of the Pere Marquette. The refunding bonds themselves underlie the issue of $50,000,000 4 per cent. 50-year general mortgage bonds authorized in January.

Detroit, Toledo & Ironton.—Rudolf Kleybolte & Co., of New York, Chicago and Cincinnati, are offering at 99 a block of $5,500,000 of the 5 per cent. three and a half year collateral notes maturing Dec. 1, 1908, redeemable at 102½. The total authorized issue is $7,000,000. The $5,500,000 were issued as described in the *Railroad Gazette* of June 30 to pay for stock of the Ann Arbor Railroad. In connection with this purchase, the general traffic manager of the Detroit, Toledo & Ironton says:

"The acquisition of a controlling interest in the stock of the Ann Arbor gives the Detroit, Toledo & Ironton a continuous line from Ironton, Ohio, and (by car ferry) from Ashland, Ky., on the Ohio river, to Frankfort, Michigan, on Lake Michigan, and thence by car ferries to Manistique and other ports, a total mileage of 726 miles. From the Jackson and Wellston district in Ohio and from the West Virginia coal fields a large business is available which has not heretofore been handled on account of want of equipment. The new equipment recently bought will enable the roads to handle this additional business. The car ferries make possible close traffic connections with the Wisconsin Central, Chicago, Milwaukee & St. Paul, and Chicago & North-Western."

Great Northern.—For the year ended June 30 the approximate gross earnings of the St. Paul, Minneapolis & Manitoba (including the Eastern Railway of Minnesota) and the Montana Central, were $43,994,035. This is an increase of $3,031,837 over the year ended June 30, 1904. These figures cover 5,088 miles of the 5,888 miles of the Great Northern system.

Hocking Valley.—It is announced that by an arrangement with J. P. Morgan & Company, the first mortgage 7 per cent. sinking fund bonds of the Columbus & Toledo, maturing August 1, will be extended until August 1, 1955, with interest at the rate of 4 per cent. J. P. Morgan & Co. will buy at par and interest, less discount at the rate of 3 per cent. per annum, any of the Columbus & Toledo bonds which the holders may prefer to sell rather than to extend.

Millen & Southwestern.—F. J. Lisman & Co., of New York, are offering at 100 a block of $100,000 of the first mortgage 5 per cent. bonds of 1955 of this company. These are part of an authorized issue of $800,000. The road is 53 miles long and runs from Millen, Ga., to Vidalia.

New Orleans Terminal.—Harvey Fisk & Sons, of New York, are offering at 95 a block of $1,000,000 first mortgage 4 per cent. 50-year gold bonds of 1953. These are part of an authorized issue of $15,000,000, of which $7,000,000 have already been issued. The bonds are guaranteed jointly and severally by the Southern and the St. Louis & San Francisco. The President of the company states that five squares of land in New Orleans have been acquired at a cost of about $1,500,000. This gives a frontage on the main street of New Orleans of 248 ft. On this property plans are now being made for building a passenger station and construction is expected to be begun this fall. In addition to the four freight houses originally built, three new freight houses are now being built.

New York Central & Hudson River.—The New York Central & Hudson River and the Lake Shore & Michigan Southern are reported to have bought about 800 acres of land between Gardenville, N. Y., and Depew, near Buffalo, which is to be used for freight terminals. This acquisition will permit the construction of a short cut-off between the two roads outside of the city of Buffalo.

Placerville & Lake Tahoe.—This company has made a mortgage to the California Title & Trust Company, of San Francisco, as trustee, to secure $1,000,000 bonds.

St. Louis, Iron Mountain & Southern.—The stockholders of the Iron Moutnain Car Trust Association have authorized an increase in the capital stock from $6,000,000 to $10,000,000. Of the new capital it is proposed to issue about $2,000,000 to pay for new freight cars and other equipment recently ordered. The remaining $2,000,000 is to be reserved for future requirements. The Association was organized in 1880 to buy equipment for the St. Louis, Iron Mountain & Southern, and the capital originally was $3,000,000. This was not long ago raised to $6,000,000. At present the Iron Mountain Car Trust certificates outstanding amount to $5,983,000.

St. Louis, Rocky Mountain & Pacific Company.—This is a new company which has been organized to build a railroad 120 miles long from Des Moines, N. M., on the Colorado & Southern, west to Raton, and thence southwest through Koehler on the Dawson Railroad, Cimmaron, and the Cimarron Canyon to the mining district near Elizabethtown, Colfax County. The company owns outright, or has mining rights on 503,700 acres of coal lands, or about 800 square miles. It is to issue first mortgage 50-year 5 per cent. gold bonds secured by (1) all the coal property, (2) $3,500,000 of the first mortgage bonds of the St. Louis, Rocky Mountain & Pacific Railroad Company and (3) $3,500,000 of the railroad company's stock. The authorized issue of the St. Louis, Rocky Mountain & Pacific Company's mortgage bonds is $15,000,000. Of this $3,000,000 is to be issued to acquire the coal properties; $500,000 to develop them, and $3,500,000 to build the railroad and put it in operation. Fisk & Robinson, of New York, are at the head of the syndicate which is financing the company.

Southern Pacific.—The stockholders will vote on August 28 on a plan to increase the capital stock of the Southern Pacific Railroad to $160,000,000. Of this amount $128,307,960 is to be isued to finally consolidate the Southern Pacific Railroad of California, the Southern Pacific Railroad of Arizona, and the Southern Pacific Railroad of New Mexico into the Southern Pacific Railroad.

Spokane International.—This projected road from Spokane, Wash., to a connection in British Columbia with the Canadian Pacific is capitalized at $4,000,000 common stock. There are also $4,000,000 first mortgage 50-year 5 per cent. gold bonds of 1955. Contracts are reported to have been let for building the 140 miles of road.

Western Maryland.—This company is now issuing regular reports of earnings. For the nine months ended March 31 gross earnings were $2,854,246 against $2,686,405 in 1904. Net earnings were $1,054,397 against $957,921 in 1904.